Summary

The discussion above has been provided to help the reader understand how the decisions in the SOR process may affect the business course BPA chooses for the future. That business course is the proper subject of this BP EIS. Issues centering on how operating the river will affect fish and wildlife survival and enhancement, trust obligations, access to salmon for treaty issues, and cultural resource impacts are fully analyzed in the SOR.

4.4 Cumulative Market Responses and Environmental Impacts of Alternatives

The following discussions address the cumulative market responses and environmental impacts of the alternatives addressed in this EIS. Market responses and impacts are first addressed under current hydro operations (4.4.2), followed by an illustrative numerical assessment of impacts (4.4.3). Market responses and environmental impacts are then assessed under DFOP hydro operations (4.4.4).

4.4.1 The Marketing Context

4.4.1.1 Evaluation of Alternatives in a Dynamic Electric Power Market

The rapid changes occurring in the electric power market (see sections 1.1 and 3.5) are a major factor in the need for BPA to evaluate its business policies. These changes also present significant challenges to the evaluation of market responses or environmental impacts. Since the Draft Strategic Business Plan and initial Draft Business Plan EIS were released in June 1994, the electric power market has continued to evolve in a manner unprecedented for the electric utility industry. The price of natural gas has declined, costs of new generation have declined, and many new prospective sellers have entered the PNW wholesale power market. The average cost of new generation has dropped by roughly one-quarter in the last year. With changes occurring so rapidly, it is difficult to make reliable estimates of gas prices, electricity rates, or electrical loads for the next 12 months, much less for the year 2002, the end-date study year for this EIS. Rate and load projections are subject to change from week to week to address new developments in the market. Despite this uncertainty, this EIS must try to show the effects of the different alternatives to enable readers and decisionmakers to assess their relative merits.

The key to the comparison of EIS alternatives is not the *numerical* estimates of power rates, resource amounts, or air emissions, but the relationships that determine those values. Although this EIS includes rough numerical estimates of the rate, load, resource, and environmental effects of the six alternatives, it is clear that these values, especially in relation to the dynamics of the market, are only a “snapshot” in time, an illustration of the relationships among the market influences; they are not conclusive as to the ultimate outcome.

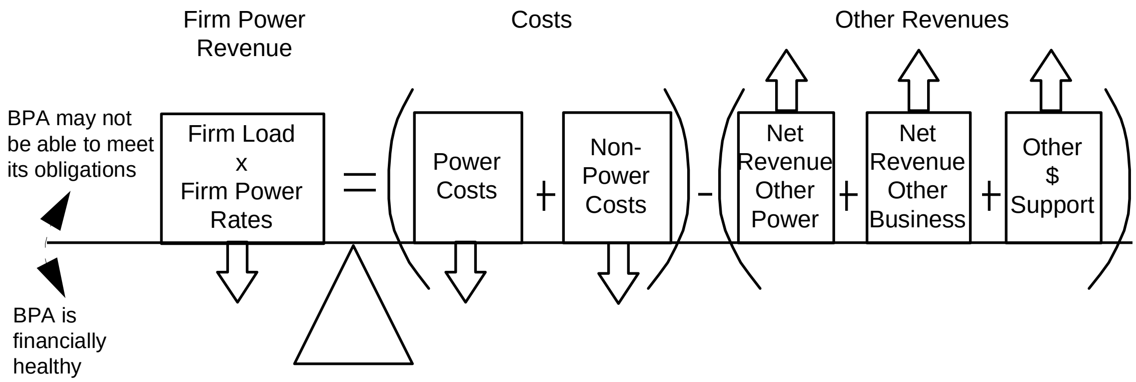
4.4.1.2 Marketing Relationships Affecting the Balance Between BPA’s Costs and Revenues

Two relationships dominate the effects of the six EIS alternatives. They are:

- <u>the effect of BPA’s rates</u>, as compared to the price of alternative power supplies, on customers’ decisions on whether to buy from BPA (and therefore on BPA’s firm loads); and
- <u>the effect of the terms of BPA service</u> on customers’ decisions on whether to buy power from BPA.

In brief, if BPA’s firm power rates are close to or higher than the price of alternative power supplies, BPA’s firm loads will decline sharply, as more and more customers choose to buy their power from suppliers other than BPA. Increases in BPA's costs will push BPA's rates upward, and increase the likelihood that BPA's firm loads will go to other suppliers. In addition, terms of BPA service that are perceived as burdensome to customers can accelerate the decline in BPA's loads, while more appealing terms can slow it down. These two relationships are the foundation for the estimates of rates, loads, and resources that are discussed in sections 4.4.2 through 4.4.4 below.

One way to conceptualize these relationships and some of the factors that influence changes in those relationships is to consider a simplified equation that summarizes BPA's marketing situation. BPA is able to meet its revenue requirements if this equation balances. The equation is as follows:



The parts of this equation are explained below.

Firm Power Rates

First, firm power rates are on the left side of the equation above because they are make up the largest share of BPA's revenues, and BPA's fiscal condition depends heavily on its success in power sales. Firm power revenues are affected by a number of factors. The most important concern is the concept of maximum sustainable revenues.

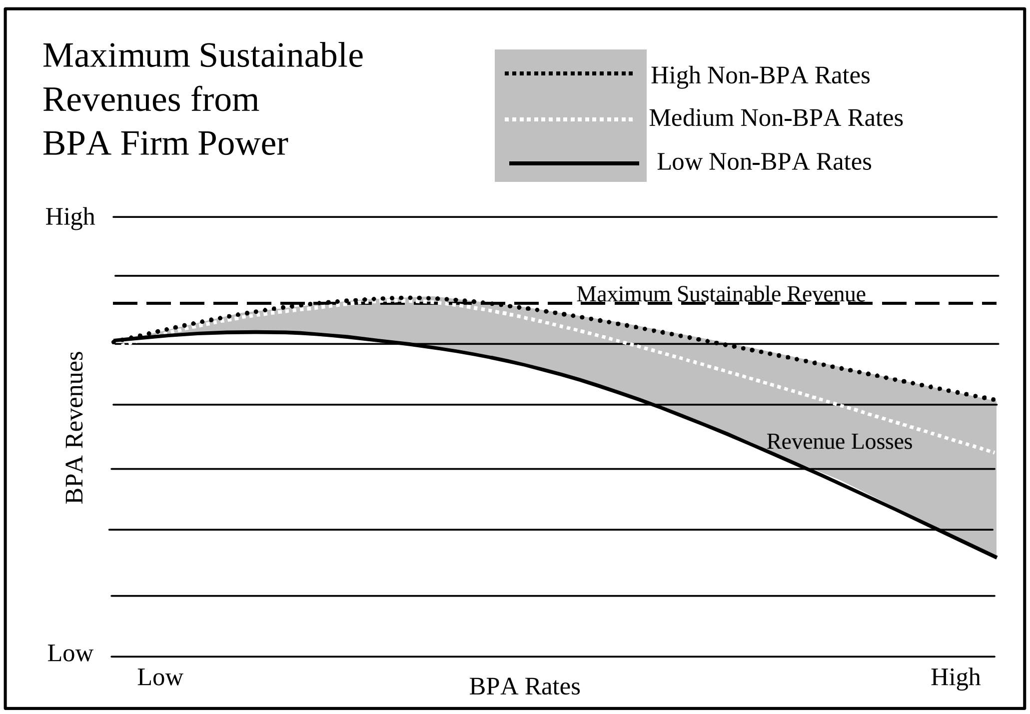
Maximum Sustainable Revenues

In the competitive power market, when BPA's rates are close to the cost of alternative power supplies, there is a point at which an increase in rates will not increase revenues. This is because the potential increase in revenues from the higher price is affected by load loss as customers look elsewhere for cheaper power. This means that the amount of revenue BPA can generate from firm power is limited by the market price for power. BPA cannot pay additional costs simply by raising rates, if rates will go above the maximum sustainable revenue level: the rate level at which BPA's revenues are highest.

In the past, when costs have increased, BPA has been able to increase firm power rates to pay for increases in its revenue requirements. Customers may not have welcomed rate increases, but the cost of BPA power even *with* rate increases was historically well below the cost of power from other suppliers. BPA's rate increases, therefore, did not significantly affect customers' willingness to continue buying power from BPA. Now, however, a competitive market has emerged for electric power, and non-BPA suppliers are beginning to offer comparable power products at prices comparable to BPA's rates. Hence, increases in BPA's rates will provide additional revenue only to the extent that customers continue to buy power from BPA.

The maximum sustainable revenue level will change as the market price for power changes. BPA firm power rates might remain constant, but if the market price for power (and therefore the maximum sustainable revenue rate level) drops below BPA's firm power rate, BPA will lose loads and revenues will decline (see figure below). Given the current market, BPA estimates that the rate level for maximum sustainable BPA revenue is roughly 29 to 33 mills/kWh for firm power.[1] There are indications in the electric energy market that the cost of non-BPA power will decline, due to a combination of increasing efficiency in new CTs, abundant supplies of natural gas, and intense competition among utilities, marketers, and IPPs, to the point where some power marketers have acknowledged a willingness to operate at a loss for some years in order to secure a share of the Pacific Northwest market.

Some customers are more sensitive to price than others; some will move load away from BPA at lower prices than others. Aluminum plants and similar flat loads can be served at lower cost than fluctuating utility loads, because they do not require services to match power deliveries to changes in loads. As a result, other suppliers can offer lower prices to serve DSIs, and the rate level where significant portions of BPA's DSI loads shift to non-BPA power supplies is lower than the maximum sustainable revenue rate level for utilities.



[1] The rate level for maximum sustainable revenue is declining and is now about 25 to 28 mills/kWh.

Tiered Rates

Another influence on firm power revenues is tiered rates. With a tiered rate structure, revenues depend on customers' willingness to purchase portions of their power at two different prices. If Tier 2 costs more, some customers will buy less at that level; some may not buy any, especially when there are competing suppliers who may offer power at prices near or below the Tier 2 price. If the Tier 2 price is set based on the marginal cost of power and that cost is close to the average cost of power, then a tiered rate structure would have little effect—the overall average rate would be the key to customers' decisions about load placement. As with all market power prices, BPA's customers' decisions whether to purchase power under a tiered rate structure will also affect BPA's firm power revenues.

Energy Resource Costs

Just as firm power produces the bulk of BPA's revenues, energy resources represent the bulk of BPA's costs. This element includes the costs of FCRPS projects assigned to power production, costs of energy conservation programs, BPA's share of the costs of the WPPSS generating projects, the costs of other resources BPA has acquired, and the costs of power purchases BPA makes to fill out its power needs. Most of these costs are long-term obligations with fixed payments that do not change over time. They do not decrease when BPA's power sales decrease. BPA's power sales must, by statute, provide the revenue to pay for these costs.

Even though the marginal cost of new generating facilities has been dropping in the last few years, BPA's costs will remain about the same as they are now, because BPA continues to meet most of its power requirements from existing facilities, and is acquiring little if any of the new low-cost generation. Aside from reduced costs available to BPA by the reinvention of its energy conservation programs, the only significant energy resource cost savings to BPA will come from lower prices for power purchases, which are driven by the market price. In general, falling costs for new power resources will sharpen the competition for BPA's loads, but will not reduce BPA's existing energy resource costs.

Net Revenues From Other Power Products and Services

Other power products and services besides firm power contribute to BPA's total revenues. Historically, BPA has frequently made sales of capacity or surplus firm power, particularly during the power surplus of the early 1980s. BPA's proposed action includes offering "unbundled" products and services in the electric power market. Products and services will be offered and priced separately so that customers may choose only those products they need, rather than accept a predetermined package of services. Unbundling would allow customers to avoid buying services they don't need or use; it would also discourage inefficient use of valuable services that are embedded in larger packages of services.

Because BPA has limited experience in the sale of unbundled services, and would offer unbundled products at cost-based rates initially, the revenue potential of unbundling is limited until the competitive market is functioning and buyers and sellers can establish the market value of the separate services. As with firm power, the revenue BPA can obtain from these products and services is limited by the price and availability of comparable products from other suppliers, i.e., the marketplace. For the near term, revenues from unbundled products and services are not likely to reduce significantly the revenue BPA relies upon from firm power sales.

Net Revenues From Other Business Lines

BPA also has or is developing other marketing capabilities that can produce substantial revenues. BPA has reorganized into three business lines: power, transmission, and energy services. Firm power and the unbundled products and services discussed above are within the power business. Transmission produces substantial revenues for BPA, and energy services has significant promise for the future. However, transmission revenues are limited to cost recovery, and energy services are not expected to produce significant supplemental revenues for several years.

Bulk power transmission regulations have changed significantly in recent years to promote competition in the power business. Transmission rates are regulated so that transmission users have access to available transmission, while transmission owners are allowed to recover their costs without exploiting their control over access to power markets. For BPA, these access provisions mean that BPA will be able to set rates to recover its transmission costs, but also that BPA's dominant position in the PNW transmission system will not be a means to enhance BPA's revenues.

Energy services is a broad category that includes energy conservation and DSM programs, telecommunications, engineering services, environmental consulting, laboratory services, hazardous waste management and cleanup. BPA could market these and other services based in most cases on expertise and capabilities BPA originally developed for its own use. These services could become a sizable share of BPA's business over time. However, BPA is only starting to develop these services: they do not yet produce revenue, and their revenue potential will be uncertain until BPA has accumulated some experience in marketing them.

Costs of Non-Revenue-Producing Activities

BPA also pays the costs of activities that, while beneficial, do *not* produce revenue. These activities include fish and wildlife restoration and enhancement actions, research and development on energy resources and transmission, and other beneficial efforts that cannot produce revenue.

Fish and wildlife enhancement efforts, as mandated under the Northwest Power Act, are a major part of these costs. Due to the continuing decline in vulnerable salmon populations, fish and wildlife agencies are developing plans which call for BPA to fund additional measures to avoid extinction of critical salmon runs and to maintain and increase populations of existing runs. Because BPA has a statutory mission to restore Columbia River salmon runs, and because efforts to date have not succeeded in reversing their decline, these costs are certain to increase, and are unlikely to decline until salmon runs show significant improvement. The costs of other non-revenue-producing activities may not be as certain, but because they are relatively small by comparison to BPA's fish and wildlife costs, they will have minor effects compared to BPA's total costs for all non-revenue-producing activities. These costs can be expected to increase in the near term and then continue at increased levels for the foreseeable future.

Other Financial Support

Finally, other financial support may offset some of BPA's costs. Because BPA is a Federal enterprise directed to pay its costs from ratepayer revenue, outside financial support has not been considered in BPA's financial planning until recently. However, increasing costs for fish and wildlife restoration, coupled with increasing competitive pressure, as discussed above, have raised the prospect that ratepayer revenues may not be enough to pay all of BPA's costs. Although BPA has paid the full costs of the program in the past, under section 4(h)(10)(C) of the Northwest Power Act, BPA's obligation to pay the costs of the regional fish and wildlife enhancement program is limited to the share of the FCRPS costs that are attributed to power production. In 1994, BPA was reimbursed for costs related to emergency flow augmentation and spill. Section 4(h)(10)(C) could be the basis for additional credits or funding for BPA's fish and wildlife costs in the future.

Conceivably, budget appropriations or other support might also be used to offset some of BPA's costs, given an adequate showing that the costs were necessary and that BPA's best efforts would not be sufficient to generate the needed revenues. Considering the well-known public sentiment opposing increases in government spending, however, this type of support for BPA's activities must be considered unlikely.

4.4.1.3 Overall Significance of the Marketing Equation in Relation to EIS Alternatives

BPA's choice among the EIS alternatives will affect its ability to maintain balance in the face of both the trend for costs to increase and loads to decline.

If BPA's rates under a given alternative are relatively higher, load losses are increased, because BPA is more vulnerable to having the price of alternative power supplies undercut BPA's price. If the terms of BPA service are relatively more burdensome, then more customers will decide not to buy from BPA regardless of price. Each alternative affects these relationships differently. Depending on BPA's costs and the terms of service under each alternative, BPA's loads and its prospects for maintaining balance between revenues and costs vary among the alternatives.

4.4.1.4 How Marketing Relates to the Development of Power Resources and Environmental Impacts

BPA's total firm power loads reflect the eventual result of customers' choice of supplier. A firm load shift away from BPA will have some predictable environmental effects.

Based on current trends in power generation technology and in the market, virtually all of the power replacing BPA firm service will come from new CTs, subject to resource development constraints imposed by public utility commissions (PUCs) or state siting authorities. Suppliers competing with BPA will build CTs to run as baseload plants to serve firm load that they have drawn away from BPA. If BPA firm loads decline below historical levels, then resources BPA would have used to serve those loads will become surplus.

Hydro generation will virtually always generate power as water is available, so the effect of a BPA surplus is to free up hydro generation from firm load service to displace other resources. The presence of a BPA firm surplus in the region would lead to decisions about which resources to displace. These decisions would be based almost entirely on economics. The highest-cost generation in the region would be displaced first, and then lower-cost until all of the surplus firm hydro generation is in use.

In the analysis of resource operations for this EIS, each of the alternatives would result in a different "stack" of resources. From most to least likely to operate, these would be existing hydro, existing thermal resources that must run (including cogeneration, renewable resources, geothermal generation, and baseload coal and nuclear plants), new efficient CTs, and existing higher-cost thermal resources (including both older CTs and some coal generators). The more new CTs built under a given alternative, the less the existing higher-cost thermal resources would run. In general, impacts of these operations, particularly on air quality, are lessened by the displacement of higher-cost thermal generation with power from new CTs, because the greater fuel efficiency of new CTs also means they produce lower air emissions per unit of power.

A higher-flow hydro operation would alter this relationship by reducing the amount of firm hydro generation available to BPA. If BPA continued to serve its current loads, it would have to replace the lost hydro capability, mainly with power purchases or new CT generation. If BPA lost load to competing suppliers, they could be expected to serve the loads with new CTs. Either way, the effect of the hydro operation would be to increase firm loads served by CT generation, and to create the same type of opportunity for new CT generation to displace higher-cost thermal generation as described above.

Environmental impacts of these load changes would be the increased impacts of new generation developed, minus the reduced impacts from displacement of existing generation that would otherwise operate. Specifically, the impacts of CTs would increase, while the impacts of higher-cost thermal generation would be reduced. On the whole, total impacts of generation would probably be reduced because the new CTs that would operate are more fuel-efficient and cleaner than the displaced higher-cost older generation.

4.4.1.5 Response to Revenue Imbalance

The equation above shows that if BPA firm loads drop, BPA would have to reduce other costs or increase other revenues to maintain balance. Conversely, if BPA costs increase, BPA revenues or other financial support would have to increase to maintain balance. Current information about market trends and BPA costs indicates that BPA loads are likely to decline if the market price of alternative resources continues to fall; that BPA costs are likely to push the equation out of balance; and that both are beyond BPA's direct control.

BPA could choose to address the imbalance through one or more response strategies. Chapter 2 (section 2.5) briefly describes response strategies BPA could pursue if its costs exceeded its maximum sustainable revenues.

Response strategies fall into the following three general categories, based on how they affect BPA's financial condition:

- Increase BPA revenues
- Reduce spending for BPA's activities
- Transfer BPA spending to other entities.

Strategies vary in their effect on BPA's ability to meet its costs, and in their feasibility. Some might mitigate a significant share of the increased spending, but would be controversial, while others might make a smaller difference in BPA spending without triggering contentious debates among BPA's customers and constituents. Some might require changes in law or executive policy. BPA's goal in selecting among available response strategies would be to achieve a cumulative change in costs, revenues, or spending responsibilities that is enough to enable BPA to meet its financial obligations, including Treasury payments, while continuing to compete in the West Coast and regional electric energy markets.

4.4.2 Market Responses and Impacts of Alternatives Under 1994-1998 Biological Opinion (SOS 2d)

The following subsections describe Business Plan EIS alternative market responses and environmental impacts assuming that current hydroelectric operations continue approximately as they are today. (See sections 2.1.6, 3.6.2.1, and 4.3.4.3.) Section 4.4.4 describes how Business Plan alternatives might change under a System Operating Strategy that provides additional spill and increased flows, as well as drawdown, to aid in anadromous fish migration.

This section evaluates market responses and their associated environmental impacts in the four key areas—resource development, resource operation, transmission development and operation, and consumer behavior—for each alternative. They are based on projected market responses to each of the individual issues that make up the alternatives. In general, the responses and impacts are driven by BPA's customers' reactions to the combination of several factors: BPA firm power costs (and customers' perceptions of the risk that those costs will increase), the perceived benefits or burdens of doing business with BPA, the prices BPA charges for its products and services, the particular BPA contract terms available in each alternative, and the options various customer classes have for obtaining power or transmission services elsewhere.

The text below uses numerical analysis to demonstrate the differences among EIS alternatives, making assumptions about rates, loads, energy resources, and environmental impacts. However, because the electric power market is changing rapidly, these results cannot be considered to be definitive. For example, since the original analysis for the BP EIS was completed in June, 1994, gas prices and CT costs have declined significantly. These and other business environment changes as described in chapter 1 (section 1.1) and chapter 3 (section 3.5) make predictions of specific rates, prices, and other numeric results, uncertain. Numerical analysis serves, however, to illustrate the principles and relationships discussed in the previous section (4.4.1).

The following is the logic for the analytical results explained below:

- Assumptions about expenditures and loads provided the basis for projecting average PF and IR rates.
- For the BPA Influence, Market-Driven, and Short-Term Marketing alternatives, tier size and price assumptions were used to generate rates for each tier of a two-tiered rate structure.
- These rates then were used to estimate two types of price effects on utility loads:
    - √ Utility decisions to purchase non-BPA power instead of BPA requirements service
    - √ Consumer responses to retail price, including fuel switching and price-induced conservation.

- For each alternative, estimates of market responses took into account the modules built into the alternative (i.e., the “intrinsic modules” identified in section 2.3).
- BPA resource acquisitions, and resource acquisitions by the rest of the region, including conservation, were identified to serve the loads as adjusted.
- Based on assumptions about economic operation of resources, such as priorities for displacement of thermal plants with secondary hydro, a spreadsheet model calculated the amounts of power provided by BPA and other resources.
  - √ Thermal resources were divided into baseload thermal, high-cost, and low-cost. Baseload plants were assumed to run at all times except during maintenance periods; high-cost resources (typically older and environmentally worse) were the first to be displaced during periods when secondary hydro was available.
- These amounts of operation, and the amounts of aluminum DSI load, were multiplied by the typical unit impacts for major categories of environmental impacts to calculate the total impacts of each alternative. BPA estimates of environmental externality costs for NO_X, SO_X, TSP, and CO_2 were applied to air emissions to provide an estimate of environmental externalities associated with thermal plant operations.
- Transmission impacts were estimated separately based on judgments about facility development under each alternative and typical land use (right-of-way) requirements for each class of transmission line projected to be constructed.

Analytical steps are described in greater detail in Appendix C. Additional planning uncertainties which could affect the results follow the analysis of the alternatives (section 4.4.5).

4.4.2.1 Status Quo (No Action)

In this alternative, existing rate and contract terms remain in place. BPA would offer utilities and DSIs new firm contracts comparable to current contracts, and would renew existing rate designs, including the Variable Industrial Rate for DSIs. BPA would not respond to the availability of competitively priced alternatives to BPA power.

Features of this alternative include:

- **Average PF** rate in 2002 would be approximately 32 to 36 mills/kWh (nominal $).
- BPA's **utility loads** would be **reduced** over **1,400 aMW** compared to 1995 Rate Case estimates, primarily due to customers choosing non-BPA generation.
- BPA's **DSI firm loads would decrease** by about **800 aMW** due to DSI use of other sources of power (self-generation and purchases from other utilities or IPPs).
- BPA would continue with conservation programs and resource acquisitions as identified in the 1992 Resource Program, leading to a **BPA firm power surplus on a planning basis of over 1,600 aMW.**
- A surplus would allow BPA to serve approximately 900 aMW of exchanging utilities’ "in-lieu" loads.
- More CTs would be acquired regionally than in other alternatives; however, the existence of these CTs would allow surplus hydro power and CT energy to be used more often to displace existing high-cost thermal plants with greater environmental impacts than CTs (e.g., Boardman, Valmy, and Centralia coal); therefore, the environmental impacts of thermal operations would be lower than under other alternatives.

The following modules are intrinsic to the Status Quo alternative (section 2.3 describes each module):

FW-1	Status Quo
RD-5	Variable Industrial Rate
DSI-1	Renew Existing DSI Firm Contracts
CR-1	"Fully Funded" Conservation

Rates

Rate projections for the Status Quo alternative are based on the 1995 Rate Case assumptions, modified by the assumptions that define this alternative (namely, fully funded BPA conservation, existing fish and wildlife, and resource acquisition programs, and planned transmission development at embedded cost) and assuming that BPA's current rate, budget, and marketing policies would continue. Rate trends were used as inputs for the analysis of loads and of the resource development and operation market responses. As shown in table 4.4-7 (section 4.4.3), the Status Quo alternative produced the highest rates of the alternatives. The assumption that BPA programs would continue without modification despite load losses implies increased rates because unchanged program costs must then be recovered from a smaller amount of firm power sales. A countervailing influence would be the cost savings resulting from using a portion of the surplus to serve in-lieu loads of IOUs that participate in the residential exchange program. (That is, rather than exchanging BPA power at the PF rate with IOUs at their average system cost in a purely accounting transaction, BPA actually would use its resources to serve a portion of the exchange load.)

Loads

Under this alternative, BPA would lose approximately 1,400 aMW of 1995 Rate Case forecast utility loads to non-BPA generation due to price competition from non-BPA suppliers. BPA also would lose approximately 800 aMW of DSI firm loads to non-BPA generation, even though total DSI loads increase 200 aMW over the 1995 Rate Case forecast. Approximately 300 aMW of the DSI top quartile would be served by interruptible power in this alternative.

Cost/Revenue Balance

Planned spending would result in BPA rate levels above the maximum sustainable revenue level, and higher than in all other alternatives. In the long term, BPA costs and revenues would not balance. In fact, the shortfall of revenues versus costs would probably be greater than in all other alternatives.

Resource Development

BPA would have acquired resources as described in the 1992 Resource Program and as shown in table 4.4-1 below (i.e., approximately 600 aMW conservation, 500 aMW new generating resources, 50 aMW of efficiency improvements, and 200 MW of planned power purchases). The rest of the region would acquire new resources with a heavy emphasis on CTs.

Resource Operations

Under this alternative, the regional load in 2002 would be approximately 22,200 aMW, with resources totaling 23,800 aMW; all of the surplus would be Federal (see tables 4.4-8 and 4.4-15 in section 4.4.3). The DSI top quartile service would be 300 aMW. Total CT operations would be about 2,500 aMW (more than any other alternative), while coal would serve about 3,200 aMW (less than in any other alternative except BPA Influence). Under Status Quo, coal operations would be at relatively low levels because BPA would continue to have a significant firm surplus, a portion of which would be sold as surplus to displace existing high-cost thermal resources, primarily coal.

Table 4.4-1: New Resource Acquisitions: Status Quo

BPA New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation*	600
Efficiency Improvements	50
Renewables	80
Cogeneration	100
Planned Power Purchases	200
Combustion Turbines	300
Coal	0
Total	**1,330**

REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation	690
Efficiency Improvements	80
Renewables	100
Cogeneration	0
Power Purchases	0
Combustion Turbines	1,740
Coal	0
Total	**2,610**

*Includes 49 aMW of conservation due to codes and standards already in place.

Transmission System Development, Operation, and Rates

BPA would continue to offer its current mix of transmission and wheeling products under current rate schedules. BPA would also continue to plan, construct, and operate its transmission system as it has in the past—that is, with a long-term, one-utility focus, and, overall, a very high level of transmission system reliability. It is likely that BPA would continue this role for the transmission system even if its share of regional load growth were smaller than in the past.

Currently planned additions to the interconnected transmission system in the Northwest Power Pool (NWPP) area (all of Washington, Oregon, Idaho, Montana, Utah, British Columbia, Alberta, most of Nevada, and western Wyoming) are shown in table 4.4-16 (in section 4.4.3 below).

EPA-92 may bring new influences not reflected in the projections to transmission system planning. Although in the past BPA made excess capacity on its transmission system available for non-Federal wheeling, EPA-92 may result in BPA providing transmission service to utilities and non-utility generators, and for building new transmission system capacity if needed to provide wheeling service. For new non-Federal power, EPA-92 would apply in all of the alternatives examined in this EIS.

Even considering the effect of EPA-92, this alternative would probably lead to the largest role for BPA in regional transmission system planning and high-voltage transmission construction among the alternatives addressed in this EIS. This is because BPA would continue to plan and construct transmission system additions using its existing reliability standards (which emphasize high regional reliability) and a long-term, one-utility planning focus. Transmission rates would be priced consistent with national transmission pricing policy. In other alternatives, it is assumed that BPA would relax or modify system planning criteria, and would have a smaller role in regional transmission development. As explained in section 4.2.4 above, under "Transmission System Development," a larger role for BPA is associated with more high-voltage transmission development in the short term (i.e., as shown in the "snapshot" for 2002 in table 4.4-16, section 4.4.3), but fewer overall kilometers of transmission in the long term (post-2002). Table 4.4-16 indicates that even in the Status Quo alternative, BPA would likely construct little new transmission in the 115- to 161-kV voltage class. The negative numbers for 115- to 161-kV transmission in that table indicate that BPA would build less new transmission of that voltage than it would take out of service (generally in order to upgrade to a higher voltage).

Consumer Behavior

Retail rate effects for a particular utility depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. The projected retail rate for Status Quo is the highest of the six alternatives (53 to 59 mills for a typical full requirements customer and 30 to 36 mills for a partial requirements customer purchasing 50 percent of its power from BPA). The burden would be relatively greater for consumers of full requirements customers than for consumers of partial requirements customers. Price-induced conservation and fuel switching would be minor (close to zero) compared with 1995 Rate Case projections in this alternative, because with BPA's rates higher than the market price, customers would take load off BPA in order to reduce their costs, and thus BPA's higher costs would not result in much of a retail price signal for many consumers.

Environmental Impacts

Under Status Quo, BPA would acquire more new generating and conservation resources than in all other alternatives (tables 4.4-1 and 4.4-11, and would have a substantial resource surplus. Other utilities would acquire their own resources rather than place load on BPA, and overall, the region would acquire more resources than in all other alternatives. Key environmental impacts of the Status Quo are summarized in section 4.4.3, tables 4.4-19 and 4.4-20. Air quality emissions and water consumption would be associated primarily with the operation of existing coal plants, the DSIs, new and existing CTs, and fuel switching. The negative numbers shown for air emissions related to power sales and purchases in table 4.4-19 result from the high level of displacement of existing thermal resources in the PSW by PNW secondary sales. Land use impacts would result primarily from transmission development, which is higher in this alternative than in most others; however, overall, land use impacts are comparable to other alternatives. Regional employment growth is predicted to be approximately 1.9 percent in the year 2002, as in all other alternatives.

Overall, this alternative would have slightly lower air quality impacts than other alternatives (except for BPA Influence). This is because BPA has surplus resources, which in part are used to displace higher cost thermal resources, such as Valmy and Centralia coal plants. While this alternative shows more CT acquisitions than other alternatives, because CT emissions are lower than coal, overall, emissions are reduced.

The final line of table 4.4-20 expresses environmental impacts in terms of environmental externality estimates. Air quality impacts from all sources shown in table 4.4-19 and summarized in the top half of table 4.4-20 are multiplied by the environmental externality estimates BPA developed for SO_X, NO_X, TSP, and CO_2. The results show that environmental externalities would be lower for Status Quo than for all other alternatives except BPA Influence; however, it should be noted that the maximum difference among all alternatives is only approximately 13 percent.

4.4.2.2 BPA Exercises Market Influence to Support Regional Goals

Features of this alternative include:

Program costs would continue as under the Status Quo.

- **Average PF** rate in 2002 would be about **30 to 34 mills**/kWh (nominal $). **Tier 1** would sell for about **29 to 33 mills**/kWh, with **Tier 2** at about **36 to 40 mills**/kWh.
- Compared to Status Quo, BPA's **utility loads** would **increase by 800 aMW**; however, compared to 1995 Rate Case assumptions BPA utility loads would be reduced approximately 600 aMW.
- Compared to Status Quo, BPA's total firm and nonfirm **DSI loads** would **decrease 700 to 1,200 aMW**.
- BPA would cut back on resource acquisitions by reducing CT purchases, but would still have **1,900 aMW firm surplus on a planning basis** due to lost loads, the addition of 380 aMW of renewables to support the "Green" Firm Power product, and BPA's renewable resource acquisition policy goals.

- A surplus would serve approximately 900 aMW of “in-lieu” loads of utilities that participate in the residential exchange program.
- Generation impacts would be lower with displacement of high-cost thermal resources.

The following modules are intrinsic to the BPA Influence alternative (section 2.3 describes each module):

RD-1 Seasonal Rates - Three Periods

RD-4 Eliminate Irrigation Discount

RD-7 Resource-Based Tier 1

DSI-2 Firm Service in Spring Only

CR-1 Fully Funded Conservation

CR-2 Renewables Incentives

CR-3 Maximize Renewables Acquisition

CR-4 “Green” Firm Power

Rates

BPA’s three-period seasonal rates would reflect hydro availability. Rates may be tiered, and the Tier 1 size would be based on a fixed percentage of Federal Base System firm capability, calculated on a monthly basis to reflect streamflows. A “Green” Firm Power rate would be offered to customers who would like acquire power served by renewable resources, the rate reflecting the cost of developing such resources. The irrigation discount (a rate discount to utilities for farmers who use electricity for irrigation or drainage) would be eliminated. Conservation spending would make BPA’s revenue requirements higher than all other alternatives except Status Quo. This alternative has the second-highest average rates (30 to 34 mills/kWh in nominal dollars).

Loads

Compared to Status Quo, BPA’s **utility loads** would **increase by 800 aMW** (table 4.4-10) primarily because of lower average rates; however, compared to 1995 Rate Case assumptions (table 4.4-9), BPA utility loads would be reduced approximately 600 aMW. BPA’s total firm and nonfirm **DSI loads** would **decrease** from Status Quo by **700 aMW** (about two-thirds of current DSI load), primarily because BPA would provide firm service in spring only, and DSIs would turn to other sources of firm service (table 4.4-10). Compared to Status Quo, BPA’s **total firm loads** would **decrease** by approximately an additional **400 aMW** by 2002, primarily because of price-induced conservation, fuel-switching, and changes in DSI firm service conditions.

Cost/Revenue Balance

Given its high rates and relatively lower loads, this alternative is least likely, after Status Quo, to achieve cost-revenue balance.

Resource Development

BPA would use market mechanisms to promote compliance with the Council Plan:

- contracts would be written so that BPA and its customers shared the costs and risks of meeting regional planning objectives; and
- rate levels would be driven by funding needs for BPA actions.

BPA would revise its plans to build the resources described in the 1992 Resource Program, eliminating some planned resources to adjust to the reductions in loads. BPA would adopt a policy goal of maximizing the acquisition of conservation and renewables to meet load. Because utilities would pick up some of the 660 aMW of conservation BPA had planned to acquire, and because BPA would offer DSM products and services, virtually all of the expected conservation would be obtained by 2002.

Table 4.4-2: New Resource Acquisitions: BPA Influence

BPA New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation*	600
Efficiency Improvements	50
Renewables	380
Cogeneration	100
Power Purchases	0
Combustion Turbines	130
Coal	0
Total**	**1,250**

REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation	690
Efficiency Improvements	80
Renewables	100
Cogeneration	0
Power Purchases	0
Combustion Turbines	1,660
Coal	0
Total	**2,520**

*Includes 49 aMW of conservation due to codes and standards already in place.

**Rounding affects total.

This alternative involves the second-greatest regional resource acquisition and therefore is the most capital-intensive and risky in the face of uncertainty in resource technology, electricity price, and end-use demand. BPA would be using capital resources that the region might use for other developments with greater economic benefits. Structurally, under this alternative, a few decisionmakers would be making major resource decisions, continuing the historical pattern of PNW energy planning that developed the Federal system, the Canadian Treaty, the Southern Intertie, and the Hydro-Thermal Power Program. This planning paradigm is the “one-utility concept,” which has been the planning concept for the development of the present regional wholesale power system.

Resource Operations

In this alternative, the regional load in 2002 would be 21,700 aMW, with resources totaling 23,600 aMW; nearly all of the surplus would be Federal. Eight hundred aMW of DSI load would be served by interruptible power. This alternative would reduce coal operations approximately 100 aMW and new CT operations by approximately 200 aMW from Status Quo (table 4.4-15).

Transmission System Development, Operation, and Rates

Under this alternative, BPA would continue to develop transmission on the basis of long-term, one-utility planning, with a high level of reliability. The major difference between this and the Status Quo alternative is that BPA would provide priority access and rate discounts to utilities that comply with the Council Plan and Program. As described in section 4.2.1.6 under the issue “Unbundling of Transmission and Wheeling Services,” a few customers that would not qualify for priority access and/or rate discounts might try to find transmission services from other sources, build their own transmission, and/or build local generation. The overall effect might be a slightly smaller role for BPA in regional transmission system development than in the Status Quo (but probably more than in other alternatives). Table 4.4-16 shows that BPA’s 500-kV transmission in 2002 is assumed to drop by approximately 10 percent to reflect this slight decrease in BPA’s role; total regional 500-kV transmission is predicted to decrease only about 5 percent. This marginal decrease in transmission might be accompanied by a minor increase in local generation; however, it is also possible that the existing transmission system might simply be operated closer to full capacity instead.

Consumer Behavior

Retail rate effects for a particular utility depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. Assuming that BPA's rates for this alternative have decreased by 2 mills/kWh (about 6 percent) from Status Quo, then the decrease in the average cost of power for the typical consumer would be:

- Full requirements customer: approximately 2 mills/kWh (about 3.5 percent)
- Partial requirements customer: approximately 0.5-mill/kWh (about 1.5 percent)

Price-induced conservation and fuel switching would be minor (close to zero) compared to Status Quo in this alternative because utility customers of BPA would take load off BPA in order to prevent their rates from rising significantly.

Environmental Impacts

Under this alternative, regional resource development would be only slightly less than under Status Quo. Overall, the regional impacts associated with new generation and transmission resource development also would be slightly less. As shown in table 4.4-15, the operations of new CTs would be approximately 20 percent lower than in Status Quo and operations of existing coal would be about 3 percent less, but operations of existing, older CTs would be approximately the same. However, the higher amount of renewable resources in this alternative would lead to greater land use impacts than all other alternatives (approximately 7 percent more). Overall, total environmental impacts (table 4.4-20) are generally comparable to the Status Quo alternative, and environmental externalities would be only about 3 percent lower than Status Quo.

4.4.2.3 Proposed Action - Market-Driven BPA

Features of this alternative include:

- Program costs are cut for conservation, administration and transmission system development, leading to lower BPA rates.
- **Average PF** rate in 2002 is about **29 to 33 mills**/kWh (nominal $). When implemented in the long term, **Tier 1** would sell for about **27 to 33 mills**/kWh, with **Tier 2** at about **36 to 40 mills**/kWh in nominal $.
- Compared to Status Quo, BPA's **utility loads increase approximately 1,400 aMW**.
- BPA's **DSI firm loads** actually **increase by 600 aMW in the short term, but decline over time.**
- BPA cuts back on resource acquisitions by reducing CT purchases and planned power purchases (200 aMW) and expects some 100 aMW of conservation formerly under BPA programs to come from independent utility programs. These changes eliminate the firm surplus shown in Status Quo.
- Generation impacts are higher because existing high-cost thermal resources are displaced less.

The following modules are intrinsic to the Market-Driven BPA alternative (section 2.3 describes each module):

FW-2 BPA Proposed Fish and Wildlife Reinvention

RD-1 Seasonal Rates - Three Periods

RD-4 Eliminate Irrigation Discount

RD-6 Load-Based Tier 1

DSI-3 Declining Firm Service

CR-4 "Green" Firm Power

Rates

This alternative assumes decreased BPA conservation expenses (with no change in energy savings achieved), decreased BPA transmission investments and replacements, and additional market revenues from products to keep the PF rate constant in nominal terms through 1999 and rising with inflation thereafter. BPA would offer a "Green" Firm Power product to those utilities that desire it (but because this product covers its own costs, it would be revenue-neutral to BPA). This alternative also assumes that, in the long term, BPA would develop a tiered rate design, with a Tier 1 size based on a percentage of historical loads for each customer and a percentage of the existing capability of FBS resources. Federal system capability serving Tier 1 loads would be fixed (purchased power would make up any gap). The Tier 2 price would equal the estimated BPA marginal cost for each year. In the long term, tiered rates would stimulate price-induced fuel-switching and conservation independent of BPA programs.

In the short term, BPA probably would not implement a tiered rates proposal, for three reasons:

- the costs of new power have dropped so rapidly that there would be no substantial difference between average costs of power and marginal costs;
- customers are moving to develop conservation programs themselves, even without a BPA tiered-rate signal; and
- under current market conditions, tiered rates appear to be a disincentive to doing business with BPA and at odds with the orientation of this alternative, which is customer-focused.

This alternative, Maximum Financial Returns, and Short-Term Marketing project the lowest rate trends for the study period except for the Minimal BPA alternative (see table 4.4-7), due to the decreases in conservation spending, overhead expenses and the cuts in transmission investments. The sale of unbundled and rebundled products is expected to produce substantial revenues that would be credited back to lower wholesale power rates.

Loads

Compared to Status Quo, under the Market-Driven alternative, BPA would gain 1,400 aMW of utility loads, primarily by keeping average and marginal (Tier 2) rates low enough to prevent many utility customers from turning to other power sources. Due to lower rates, BPA would regain, **in the short term,** a total of almost 600 aMW of DSI loads lost in the Status Quo alternative to other power sources. **In the long term,** however, public agency and DSI firm loads are assumed to decrease somewhat from year to year in response to the Tier 2 rate and DSI contract terms.

Cost/Revenue Balance

Overall, this alternative would be more likely than Status Quo to maintain BPA's cost/revenue balance because cost containment and the development of products and services that respond to customer needs would help reduce rate increases and retain load.

Resource Development

This alternative assumes that:

- costs and risks would be shared only with full requirements customers under long-term contracts;
- flexible short- and long-term arrangements would be offered; and
- unbundled products would be competitively priced.

BPA would not acquire the additional generation proposed by the 1992 Resource Program other than resources already committed to, but would rely on short-term purchases to fill in any deficits.

BPA direct conservation acquisition would be reduced, but independent conservation programs carried out by customers would make up the difference, so that conservation targets for BPA loads would continue to be achieved. BPA would acquire renewable resources to support sales of "green" power to utilities that pay for that product's additional cost. Other BPA resource acquisitions would be the same as for the BPA Influence alternative. Because BPA loads would be higher, there would be little if any surplus. Any in-lieu power deliveries under the Residential Exchange would be based on spot market power purchases. Regional resource development would be less than under the Status Quo or BPA Influence alternatives because fewer new CTs would be developed to serve loads shifted away from BPA. If market competition and low gas prices continued to put downward pressure on the market price for power, existing baseload resources, such as WNP-2, would become increasingly uneconomic, and could be shut down. It is likely that additional power purchases would replace any such terminated baseload resources.

Under this alternative, numerous decisionmakers are choosing energy purchases or resource developments. Efficiency may be reduced if the individual decisions are not coordinated, but errors arising from incomplete information or changing conditions would tend to be smaller, and the consequences less than would result from misdirection of a comprehensive regional plan.

Table 4.4-3: New Resource Acquisitions: Market-Driven BPA (Proposed Action)

BPA New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation*	460
Efficiency Improvements	50
Renewables	80
Cogeneration	100
Planned Purchases	190
Combustion Turbines	130
Coal	0
Total**	**1,000**

REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation	800
Efficiency Improvements	80
Renewables	100
Cogeneration	0
Planned Purchases	0
Combustion Turbines	690
Coal	0
Total	**1,660**

*Includes 49 aMW of conservation due to codes and standards already in place.

**Rounding affects total.

Resource Operations

The regional loads and resources would each be approximately 22,500 aMW in 2002, with no regional or BPA surplus. This alternative incorporates new DSI firm contracts that would not incorporate a quartile structure, and there is, therefore, no top quartile service in this alternative. Compared to the Status Quo alternative, this alternative has less than half the operations of new CTs; however, existing higher-cost thermal resources (coal and older CTs) operate somewhat more than in Status Quo (table 4.4-15). BPA would analyze all planned and existing generation projects and consider terminating those that are more expensive than firm power purchases or new resources.

Transmission System Development, Operation, and Rates

BPA could continue in its role as the main provider of regional transmission facilities. The major difference between this and the Status Quo alternative is that, after BPA reviews its reliability criteria with its customers, it is likely that BPA's transmission system would evolve over the long term toward a lower-cost, somewhat lower-reliability system. In addition, unbundling transmission services and pricing transmission using more distance-based rates and opportunity and incremental pricing, to the extent adopted, would lead to clearer price signals that might lead to more efficient transmission development. Making wheeling contracts assignable might mean that the existing transmission system would be used more efficiently and that less new transmission would be needed.

If BPA's customers want BPA to reduce overall transmission costs by planning toward a somewhat less stringent reliability standard, BPA would construct less new transmission capacity, and operate the existing capacity at higher load factors (i.e., closer to "full capacity"). New facilities would be constructed as needed to serve Federal loads, to respond to FERC-ordered transmission service (where existing capacity is fully utilized), and where the costs of adding new capacity can be recovered by wheeling revenues for the facility in question. System outage frequencies could increase somewhat, as transmission facilities would be constructed and operated with lower "reserves." Transmission pricing signals could lead to more local generation and some degree of increased transmission development by utilities other than BPA. Although it is difficult to identify the specific projects BPA might postpone or avoid, for the purposes of analysis, table 4.4-16 shows a 10-percent drop in BPA construction of new 500-kV transmission in 2002; total regional 500-kV transmission is predicted to decrease only about 5 percent. BPA's 230-kV transmission development might decrease to a greater extent; for example, projects such as the 22-km (13.7-mi) St. Clair-Olympia project or 40-km (25-mi) Snoking-Maple Valley lines might be constructed by other utilities and/or avoided (at the cost of decreased reliability). Table 4.4-16 shows BPA would reduce 230-kV transmission development by approximately 50 percent, while 230-kV development by other utilities would increase by approximately 20 percent compared to Status Quo. Overall, however, regional 230-kV development would be only slightly less than in Status Quo.

Consumer Behavior

Retail rate effects for a particular utility depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. Assuming that BPA's rates for this alternative are approximately 3 mills/kWh (about 9 percent) lower than for Status Quo, then the decrease in the average cost of power for a typical consumer would be:

- Full requirements customer: approximately 3 mills/kWh (about 5 percent)
- Partial requirements customer: approximately 1 mill/kWh (about 2 percent)

Price-induced conservation and fuel switching would be minor (close to zero) compared to Status Quo in this alternative because BPA's rate would be close to the market price for power.

Environmental Impacts

BPA and the region acquire only about two-thirds the amount of new resources acquired in Status Quo. Most impacts associated with new regional resource development are lower than in Status Quo (table 4.4-19). Impacts associated with the operation of existing coal, CTs, extraregional sales, and power purchases are somewhat higher than in Status Quo, in part because more existing coal generation operates. Environmental externality costs associated with air emissions of new and existing thermal generation are approximately 4 percent higher than in Status Quo (table 4.4-20), primarily because of higher amounts of coal operations. Electricity rates are lower than in Status Quo for public and private utility customers; however, the overall slight boost to the regional economy is not large enough to cause statistically significant growth in employment.

4.4.2.4 Maximize BPA's Financial Returns

For the Maximize Financial Returns alternative, BPA would cut costs without implementing tiered rates, resulting in increased revenues.

Features of this alternative include:

- Program costs would be cut for conservation, generation and transmission system development, leading to lower rates than Status Quo.
- **Average PF** rate in 2002 would be about **29 to 33 mills**/kWh (nominal $), allowing BPA a 10 percent return over cost. Rates would be capped at the maximum sustainable revenue point.
- BPA's **utility loads would increase** by about **1,400 aMW** compared to the Status Quo alternative, due to **consumer responses to lower rates**.
- BPA's **DSI loads would increase by about 600 aMW** due to price changes.
- With a potential firm surplus eliminated, BPA would plan almost **500 aMW of power purchases** to meet loads. About 100 aMW of conservation formerly under BPA programs would come from independent utility programs.
- Higher loads would increase thermal generation and impacts, from both high-cost older generators and lower-cost new generators.

The following modules are intrinsic to the Maximize Financial Returns alternative (modules are described in section 2.3):

FW-3 Lump-Sum Transfer

RD-4 Eliminate Irrigation Discount

DSI-5 100% Firm Service

CR-4 "Green" Firm Power

Rates

Consistent with the principles of this alternative, BPA would set its rates close to, but not above, the maximum sustainable revenue level. This would lead to rates that would be comparable to those in the Market-Driven BPA alternative.

Loads

Under the Maximize Financial Returns alternative, BPA would retain approximately 1,400 aMW of utility loads lost to other power sources in Status Quo because BPA prices would be preferable to non-BPA generation. Compared to Status Quo, BPA would gain almost 600 aMW of DSI loads. Overall, BPA total firm loads would be 1,400 aMW higher than under Status Quo (approximately the same as in Market-Driven BPA). There would be no DSI top quartile service in this alternative, because it is assumed that the contracts offered under this alternative would not include a top quartile service provision.

Cost/Revenue Balance

This alternative would be more likely than any other except Minimal BPA to achieve cost/revenue balance because BPA would cut program costs as necessary to retain loads.

Resource Development

BPA would acquire new generation in the form of almost 500 aMW of power purchases, but would terminate conservation contracts that were not self-supporting. Any additional conservation BPA developed would result from new DSM efforts undertaken as part of marketing activities.

Conservation acquisition would be less than in all alternatives except Minimal BPA, and power purchases would be higher than in all other alternatives. Because BPA would retain most of its load, competitors would build fewer new CTs to serve load moving away from BPA service. However, as in Market-Driven BPA, if market competition and low gas prices continued to put downward pressure on the market price for power, existing baseload resources, such as WNP-2, would become increasingly uneconomic, and could be shut down. It is likely that additional power purchases would replace any such terminated baseload resources.

Under the Maximum Financial Returns alternative, as under the Market-Driven alternative, numerous decisionmakers are choosing energy purchases or resource developments. Efficiency may be reduced if the individual decisions are not coordinated, but errors arising from incomplete information or changing conditions would tend to be smaller, and the consequences less than would result from misdirection of a comprehensive regional plan.

Resource Operations

In this alternative, the regional load in 2002 would be 22,500 aMW, with both the Federal and total regional systems in load/resource balance. Compared to the Status Quo alternative, this alternative shows substantially more operation by existing coal and CT generation, in part because fewer new CTs would be acquired regionally than in any other alternative (see tables 4.4-13 and 4.4-15 in section 4.4.3). BPA would analyze all planned and existing generation projects and consider terminating those that are more expensive than firm power purchases or new resources.

Table 4.4-4: New Resource Acquisitions: Maximize Financial Returns

BPA New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation*	260
Efficiency Improvements	50
Renewables	80
Cogeneration	100
Planned Purchases	470
Combustion Turbines	130
Coal	0
Total	**1,070**

REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation	800
Efficiency Improvements	80
Renewables	100
Cogeneration	0
Planned Purchases	0
Combustion Turbines	560
Coal	0
Total	**1,520**

*Includes 49 aMW of conservation due to codes and standards already in place.

Transmission System Development, Operation, and Rates

BPA's transmission system planning and development would focus on maximizing returns from each component of the transmission system. BPA's statutes may limit BPA from receiving significant "profits" from specific transmission investments; however, BPA might construct new transmission facilities to access new markets for power sales or sources of power. For example, it might participate in the development of new transmission links to the inland Southwest in order to make sales and exchanges to that region, or it might construct additional transmission capacity to access gas supplies in Alberta (if it could not gain access to the same markets through FERC-ordered transmission service on other utilities' facilities). BPA might also sell existing facilities for which revenues do not cover the costs of operations, maintenance, and repair. Transmission of Federal power would be sold separately from the power itself, and the range of costs of transmitting Federal power to different parts of the BPA system would be reflected in the range of costs paid by customer utilities.

Although BPA might construct new transmission lines to access strategic markets (included in the total of BPA 500-kV transmission development in table 4.4-16 is at least one such project, a 200-km (124-mi) line), overall, BPA's share of regional transmission development (particularly 200-kV and below) would probably fall. As indicated in table 4.4-16, it is assumed that BPA and regional 500-kV transmission development would be only slightly less than in Status Quo in 2002; however, BPA 230-kV transmission development would be only 10 percent of the amount projected for Status Quo. Other utilities' 230-kV transmission development would increase 50 percent as they incrementally added 230-kV facilities to replace the regional 500-kV transmission not constructed by BPA. Additional local generation facilities (e.g., cogeneration or CTs) might be developed in response to the net reduction in 230-kV transmission development.

Consumer Behavior

Retail rate effects for a particular utility depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. Assuming that BPA's rates for this alternative are approximately 3 mills/kWh (about 9 percent) lower than for Status Quo, then the decrease in the average cost of power for the typical consumer would be the same as for Market-Driven:

- Full requirements customer: approximately 3 mills/kWh (about 5 percent)
- Partial requirements customer: approximately 1 mill/kWh (about 2 percent)

In 2002, price-induced fuel switching *to* electricity would increase from the Status Quo alternative by approximately 100 aMW, reflecting the relatively low average PF rate and lack of tiered rates in this alternative.

Residential exchange loads of IOUs would decrease by approximately 200 aMW.

Environmental Impacts

In this alternative, BPA would acquire fewer new resources than under the Status Quo, and would rely more on power purchases to serve load (table 4.4-11). Other utilities also would acquire fewer new resources, and as a result, regional new resource acquisitions and associated land use, air, and water impacts would be less than under the other alternatives (table 4.4-13 and 4.4-19). However, land use associated with new transmission development would be greater than in all other alternatives, in part because BPA would build intertie lines where financially attractive, and would construct less transmission for regional needs. Other utilities would build transmission instead of BPA, but would do so at lower voltages (requiring more miles of transmission right-of-way to serve loads) (table 4.4-16).

Air and water impacts from the operation of existing coal and CTs, and from power purchases (assumed to be thermal generation such as CTs) would be higher than under Status Quo. Because this alternative involves a high level of power purchases, it is likely that much of the thermal generation impacts would occur outside the region (e.g., the Pacific Southwest). The primary influence on air quality impacts would be the high existing coal operations in this alternative (higher than all others). As a result, environmental externality estimates for air quality impacts of this alternative would be higher than any other alternative except Minimal BPA (see table 4.4-20). On a regional basis, electric rates would be slightly lower, but this does not translate into significant changes in employment growth.

4.4.2.5 Minimal BPA Marketing

In the Minimal BPA alternative, BPA would cut costs and eliminate all resource acquisitions recommended in the 1992 Resource Program, including conservation, that are not already under construction.

Features of this alternative include:

- Program costs would be cut for new conservation and transmission system development.
- **Average PF** rate in 2002 would be about **28 to 32 mills**/kWh (nominal $).
- BPA's **utility loads would increase** by about **1,600 aMW**, compared to Status Quo.
- BPA's **total DSI loads** would be approximately the same as in Status Quo. DSI top quartile service would not be offered under this alternative.
- BPA would drop most CT acquisitions and all other resource acquisitions except for small amounts of resources already under construction. About 130 aMW of conservation formerly under BPA programs would come from independent utility programs. **BPA would be in load-resource balance**.
- Higher loads would increase thermal generation and impacts, from both high-cost older generators and lower-cost new generators. Total thermal operations would be higher than under all other alternatives.

The following modules are intrinsic to the Minimal BPA alternative (modules are described in 2.3):

FW-3 Lump-Sum Transfer

DSI-3 Declining Firm Service

Rates

Without the added cost of new resource acquisitions and transmission construction after 1996, BPA's rates would remain low, but the limited supply of BPA power would force customers to acquire resources to serve their load growth. This alternative projects an average PF rate lower than all other alternatives (in the range of 28 to 32 mills/kWh in nominal dollars). Although costs would be reduced substantially, no additional revenue from the market-based sale of bundled or unbundled products would be available.

Loads

BPA's utility loads would increase by about 1,700 aMW, compared to Status Quo, because utilities would not turn as much to other sources of power and because lower rates would cause "reverse fuel switching" (that is, switching from gas to electricity). Under the Minimal BPA alternative, BPA would retain the firm utility loads lost in the Status Quo alternative, and DSI total loads on BPA would be approximately the same as in Status Quo.

Cost/Revenue Balance

Because BPA could sell all of its limited supply of firm power due to its relatively low cost, there would be no BPA firm surplus, and costs and revenues would balance.

Resource Development

BPA would terminate or buy out any obligations to acquire further conservation, renewables, or cogeneration, as shown in table 4.4-5. Because BPA would sell all of its limited supply of firm power, there would be no BPA firm surplus. The rest of the region would develop resources at market prices, almost exclusively CTs, but also some conservation, to serve load growth. DSIs would have to buy power from other suppliers to replace BPA power as utilities exercised their preference rights to BPA power. The resource development role would be assumed by other regional utilities and IPPs. With the large number of decisionmakers involved, this alternative could lead to the greatest regional acquisition of CTs of all the alternatives except Status Quo and BPA Influence. If BPA terminated any existing resources, there would not be any BPA acquisitions to replace lost output, and development or power purchases by the rest of the region would have to increase to meet the total regional demand.

Table 4.4-5: New Resource Acquisitions: Minimal BPA

BPA New Resource Acquisitions - 2002		REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**	**Resource Types**	**aMW**
Conservation*	130	Conservation	800
Efficiency Improvements	50	Efficiency Improvements	80
Renewables	0	Renewables	100
Cogeneration	100	Cogeneration	0
Planned Purchases	0	Planned Purchases	0
Combustion Turbines	130	Combustion Turbines	1,530
Coal	0	Coal	0
Total**	**400**	**Total****	**2,500**

*Includes 49 aMW of conservation due to codes and standards already in place.

**Rounding affects total.

Resource Operations

Under this alternative, the regional load in 2002 would be 22,800 aMW, with both the smaller Federal system and the regional system in load/resource balance. With the Federal system not growing, there would be more CT construction by others; this alternative would result in the largest new CT generation development among the alternatives except Status Quo and BPA Influence—approximately 1,700 aMW. The operation of existing coal and CT resources would also be high, and overall, thermal operations would be higher than in all other alternatives.

Transmission System Development, Operation, and Rates

In this alternative BPA would continue to maintain and replace existing transmission facilities, but would construct few new facilities. Although under EPA-92 FERC could order BPA to construct transmission capacity for a party requesting such service, it is assumed here that BPA would avoid significant new construction.

Existing loads would be served under existing transmission rates schedules. Load growth would be served by utilities other than BPA, and new transmission capacity to serve new load and to integrate generating resources would be constructed by other utilities. Although BPA (which currently owns three-quarters of the region's transmission capacity) would continue to play an important role in transmission system operations, over time the responsibility for maintaining the reliability of the transmission system by adding new capacity would devolve toward other utilities. To the extent that RTGs provide a forum for transmission system planning to replace BPA's current role, transmission planning might continue to have a long-term focus; however, it is likely that the balance between cost and reliability might shift somewhat in the direction of lower cost. Other utilities would take on larger transmission development roles; however, the overall growth in regional transmission capacity would probably be less than under the Status Quo alternative. BPA would construct new 500-kV transmission only where necessary to relieve existing transmission reliability problems or transmission constraints. It is assumed, as shown in table 4.4-16, that in 2002, BPA's share of 500-kV transmission would shrink to less than half that of Status Quo, and its share of 230-kV transmission to only 5 percent of the amount under Status Quo. On the other hand, the amount of 230-kV transmission by other utilities would increase by 75 percent compared with Status Quo, as they incrementally added 230-kV facilities to replace the 500-kV transmission not constructed by BPA. Overall, regional 500-kV transmission would drop by 25 percent, and 230-kV transmission development would increase by approximately 10 percent. In the long-term (post-2002), significant increases in 230-kV transmission could be predicted, because as loads and resources in the region grow, it would require more kilometers of 230-kV transmission to accommodate that growth than if 500-kV transmission were constructed.

Consumer Behavior

Retail rate effects for a particular utility depend on the ratio of BPA-purchased power costs to total costs and total kWh sales for the utility. Assuming that BPA's rates for this alternative are approximately 4 mills/kWh (about 12 percent) lower than Status Quo, then the decrease in average cost of power for the typical consumer would be:

- Full requirements customer: approximately 4 mills/kWh (about 7 percent)
- Partial requirements customer: approximately 1 mill/kWh (about 3.6 percent)

In 2002, price-induced fuel switching *to* electricity would increase from the Status Quo alternative by approximately 100 aMW, reflecting the relatively low average PF rate and lack of a tiered rate structure in this alternative.

Residential exchange loads of IOUs would increase by 100 aMW in response to the relatively lower rate for PF power exchanged compared to the Status Quo.

Environmental Impacts

Under this alternative, BPA would acquire few new generating resources or transmission facilities (tables 4.4-5 and 4.4-16). In BPA's place, other utilities would acquire new resources, particularly CTs. Air, land, and water impacts associated with new resource development and operation would be higher than in all other alternatives except Status Quo and BPA Influence. Overall, the operation of existing and new thermal resources would be higher than all other alternatives. As a consequence, environmental externality estimates for air quality impacts of this alternative are higher than all other alternatives (table 4.4-20) but still would be only about 13 percent higher than Status Quo. Regional electric rates would be slightly lower than under Status Quo, but the positive effect on the economy would not be sufficient to cause any statistically significant difference in regional employment growth rates.

4.4.2.6 Short-Term Marketing

Features of this alternative include:

- Program costs are cut for new conservation and resource acquisitions and new transmission system development, unless cost-effective in 5 years or less.
- **Average PF** rate in 2002 would be **29 to 33 mills**/kWh (nominal $). Tier 1 would be priced at 27 to 31 mills/kWh; Tier 2 would be 36 to 40 mills/kWh (nominal $).
- BPA's **utility loads** would increase approximately **1,400 aMW** compared to Status Quo. BPA would use 300 aMW of surplus to serve "in-lieu" loads of utilities participating in the residential exchange program.
- BPA's **DSI total loads** would be approximately the same as under Status Quo, with 800 aMW lost to other power sources compared to the 1995 Rate Case assumptions.
- BPA would drop most renewables acquisitions. About 130 aMW of conservation formerly under BPA programs would come from independent utility programs. BPA would be in **load-resource balance** after serving approximately 300 aMW of in-lieu loads.
- Higher loads and lower resource acquisitions than most other alternatives would lead to increased thermal generation and impacts from existing coal and CT resources.

The following modules are intrinsic to the Short-Term Marketing alternative (modules are described in section 2.3):

FW-2 BPA Proposed Fish and Wildlife Reinvention

RD-4 Eliminate Irrigation Discount

RD-8 Market-Based Tier 2

DSI-3 Declining Firm Service

Rates

Without the added costs of new resource acquisitions and transmission construction, BPA's rates would remain low, but the limitation on BPA power to short-term sales would cause the generating customers to obtain their own supplies. BPA's average PF rate would be lower than under Status Quo, and about the same as under the Market-Driven alternative.

Loads

Under the Short-Term Marketing alternative, as under the Maximize Financial Returns alternative, BPA would retain the forecasted 1995 Rate Case utility loads because utilities would continue to place load on BPA rather than turn to other sources, in large part due to lower rates. Utility loads on BPA would increase by 1,400 aMW compared with Status Quo; overall firm loads would be 1,000 aMW higher than Status Quo. There would be no top quartile service offered to DSIs in this alternative, but total DSI loads on BPA would be about the same as under Status Quo. After 2001, it is assumed that BPA's traditional public agency load would increasingly be served by new public utility generation (CTs), based on a desire for long-term service as the perceived risks of BPA cost increases. This shift in public agency loads to CTs would leave BPA with surplus firm power which it would use to serve approximately 300 aMW of "in-lieu" loads of IOUs participating in the residential exchange program.

Cost/Revenue Balance

While BPA's costs would be the same as the Market-Driven BPA alternative, the limitation on sales to a 5-year maximum term might make it more difficult for BPA to recover its costs and thus maintain stable rates in the long term.

Resource Development

BPA would function primarily as a broker, making long-term acquisitions only if they were economically justified in support of short-term marketing.

- Prices of unbundled products and transmission would be based on cost and market competitiveness.
- Transmission would be planned and constructed to enhance marketing opportunities.

Table 4.4.-6 shows resource acquisitions in this alternative.

Table 4.4-6: New Resource Acquisitions: Short-Term Marketing

BPA New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation*	350
Efficiency Improvements	50
Renewables	0
Cogeneration	100
Planned Purchases	80
Combustion Turbines	130
Coal	0
Total**	**700**

REST OF REGION New Resource Acquisitions - 2002	
Resource Types	**aMW**
Conservation	800
Efficiency Improvements	80
Renewables	100
Cogeneration	0
Planned Purchases	0
Combustion Turbines	940
Coal	0
Total	**1,910**

*Includes a 49 aMW of conservation due to codes and standards already in place.
**Rounding affects totals.

The Short-Term Marketing alternative, like the Market-Driven alternative, has numerous decisionmakers involved in development of the regional power system, with the same effects as under the Maximize Financial Returns alternative.

Resource Operations

In this alternative, the regional load in 2002 would be 22,500 aMW, with both the Federal and regional systems in load/resource balance. The profile of resource operations is very similar to that in Maximize Financial Returns. New CT operations would be slightly lower than under the Minimal BPA alternative (approximately 500 aMW) (see table 4.4-5).

Transmission System Development, Operation, and Rates

BPA would phase out long-term contracts and market new power and transmission services only on a short-term basis (less than 5 years), to the extent that doing so is consistent with EPA-92. BPA would have almost no incentive to construct new transmission, unless it were offered long-term no-risk contracts to construct specific new facilities. The effects on transmission system development would probably be similar to those of the Minimal BPA Marketing alternative; i.e., less BPA and more non-BPA transmission development in the short term, and more localized generation (e.g., CTs and cogeneration).

Consumer Behavior

Retail rate effects for a particular utility would depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. Assuming that BPA's rates for this alternative would be approximately 3 mills/kWh (about 9 percent) lower than for Status Quo, then the decrease in the average cost of power for the typical consumer would be the same as for Market-Driven:

- Full requirements customer: approximately 3 mills/kWh (about 5 percent)
- Partial requirements customers approximately 1 mill/kWh (about 2 percent)

In 2002, price-induced conservation and fuel switching would show minor changes (near zero) compared with the Status Quo alternative.

Residential exchange loads of IOUs would decrease by 100 aMW.

Environmental Impacts

In this alternative, BPA would acquire fewer conservation and generation resources than in Status Quo. The impacts to air and water from the operations of new and existing resources would be higher than under Status Quo, primarily because of increased operation of existing coal and CT resources (tables 4.4-15 and 4.4-19). Overall, the environmental externality estimates for air quality impacts of this alternative would be higher than all alternatives except Maximize Financial Returns and Minimal BPA (table 4.4-20). Although regional electric rates would be lower than under Status Quo, this effect would not be large enough to cause any statistically significant difference in regional employment growth rates.

4.4.3 Summary of Illustrative Results Under 1994-1998 Biological Opinion Hydro Operation

This section summarizes and provides the numerical documentation of the analysis presented in section 4.4.2. As pointed out at the beginning of that section, in the current electric utility climate, prices and conditions are changing so rapidly that numerical analysis cannot be considered definitive. However, BPA expects that the principles behind the analysis and the behavior of parties in this business remain constant, and that the numerical analysis serves to illustrate how those behaviors and relationships work.

Some basic analytical assumptions are the same for all of the alternatives, as follows:

- Inputs from the 1995 Rate Case assumptions remain constant:
  - √ Medium load forecasts
  - √ Generating resource costs
  - √ Fuel costs and availability
  - √ Regional generating resource supply curves
  - √ Resource Program acquisitions, except as noted.
- Pacific Northwest Coordination Agreement and Columbia River Treaty planning procedures and obligations remain unchanged.
- DSI loads served by BPA are different among alternatives, but it is assumed that aluminum prices and demand for DSI products are high enough that in the year 2002 a total of 2,700 aMW of DSI load would operate under all alternatives.
- Transmission access is consistent with the Energy Policy Act of 1992. The exception would be under Minimal BPA, in which BPA would attempt to be exempt from the requirement to construct new transmission.
- BPA organic statutes, including the Bonneville Project Act, the Federal Columbia River Transmission System Act, the Regional Preference Act, and the Northwest Power Act remain unchanged, except as noted.

4.4.3.1 Rates

Table 4.4-7 illustrates the nominal PF rate levels that might occur in each alternative in 2002 under the assumption of current hydro operations. For the BPA Influence, Market-Driven BPA, and Short-Term Marketing alternatives, in the long term, BPA would sell firm power under tiered rate structures, so the prices for the two tiers are shown below the average price (although for the Market-Driven BPA alternative, tiered rates might not be implemented in the short term).

Table 4.4-7: Average PF Rate in 2002 (mills/kWh; nominal $)
SOS: 1994 - 1998 Biological Opinion

Alternative	Status Quo	BPA Influence	Market-Driven	Maximize Financial Return	Minimal BPA	Short-Term Marketing
Average	32 - 36	30 - 34	29 - 33	29 - 33	28 - 32	29 - 33
Tier 1	N/A	29 - 33	27 - 31	N/A	N/A	27 - 31
Tier 2	N/A	36 - 40	36 - 40	N/A	N/A	36 - 40

The rate levels were the starting point for further evaluations of loads and market responses to alternatives. Typical responses by customer category are illustrated in figure 4.4-1. Initial rate estimates included adjustments to anticipate their cost and load effects.

Additional load losses not included in the rate projections would push BPA power rates higher, as would additional resource costs. That is, if market conditions or other factors cause BPA's customers to serve more of their loads from non-BPA suppliers than is estimated here, BPA's costs would be distributed over a smaller base of sales; rates would therefore have to be higher to provide the same amount of revenue. Similarly, even if BPA's loads are as assumed here, increases in resource costs would add to BPA's revenue requirement and result in increases in BPA's rates unless BPA developed additional revenue from other products separate from firm requirements power sales. *In either case, the practical limit on BPA's rate level is the maximum sustainable revenue level.*

The Status Quo alternative increases BPA power rates due to continuing expenditures at historical levels for energy conservation programs, resource acquisitions, transmission construction, and fish and wildlife enhancement. In the BPA Influence, Market-Driven, and Short-Term Marketing alternatives, the Tier 2 rate is set near the long-term cost of alternative resources. For all three tiered-rates alternatives, the Tier 1 rate increases as necessary to generate enough revenue to meet BPA's requirements.

Rates for the Minimal BPA alternative are lower, because of lower program spending and no resource acquisitions. Rates for the Maximize Financial Returns alternative are deliberately set at the maximum sustainable revenue level (approximately 30 to 32 mills in nominal dollars).

4.4.3.2 Loads

Loads for the EIS alternatives in 2002, under current river operations, are shown in table 4.4-8.

FIGURE 4.4-1

Market Responses of Customers to Increases in BPA's Rates for Products and Services

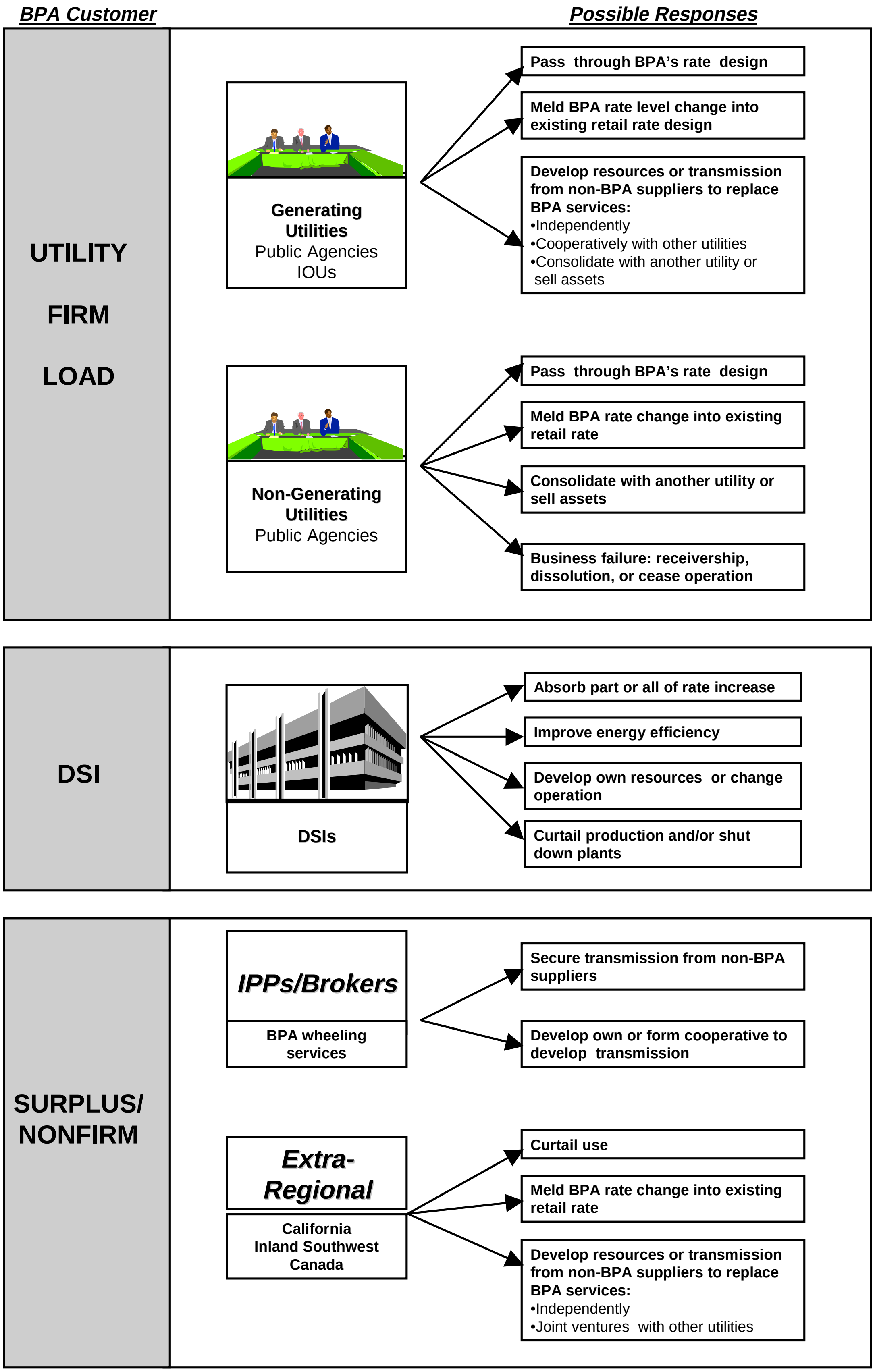


Table 4.4-8: Comparison of Loads and Resource Development by 2002 (aMW)

All numbers except Rate Case numbers and adjusted totals represent differences from 1995 Rate Case Forecast

			Rate Case	Status Quo	BPA Influence	Market Driven	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
1	**BPA**	1995 Rate Case loads for 2002	9,000	9,000	9,000	9,000	9,000	9,000	9,000
2		Price-induced conservation		0	0	0	0	0	0
3		Fuel switching		0	0	0	100	100	0
4		Change in DSI load forecast from RC			200	200	200	200	200
5		DSI Load from RC served as interruptible			-800	0	0	0	0
6		Utility self-generation		-1,400	-600	0	-100	200	0
7		DSI self-generation (for firm load)		-800	-1,500	-200	-200	-800	-800
8		Residential exchange in-lieu load		900	900	0	0	0	300
9		Load obligation transfer (re BPA conserv.)			0	-100	-100	-500	-100
10		Adjusted BPA load	9,000	7,600	7,200	8,900	9,000	8,300	8,600
11									
12		1995 Rate Case interruptible load	0	0	0	0	0	0	0
13		Change in interruptible load		300	800	0	0	0	0
15		Adjusted BPA interruptible load	0	300	800	0	0	0	0
16									
17		1995 Rate Case resources for 2002	8,700	8,700	8,700	8,700	8,700	8,700	8,700
18		Conservation		600	600	500	300	100	300
19		Combustion turbines		300	100	100	100	100	100
20		Other (effic., renewables, co-gen)		200	500	200	200	100	100
21		Power purchases		200	0	200	500	0	100
22		Conservation already deducted from RC			-500	-500	-500	-500	-500
23		Gen. resources already deducted from RC			-300	-300	-300	-300	-300
24		Adjusted BPA resources	8,700	9,200	9,000	8,900	9,000	8,400	8,600
25									
26		Adj. BPA firm load/resource balance (resources - loads)	-300	1,600	1,900	0	0	0	0
27									
28	**Rest of Region**	1995 Rate Case load for 2002	13,300	13,300	13,300	13,300	13,300	13,300	13,300
29		Load increase from utility & DSI self-gen			2,100	200	300	600	800
30		Load inc. from DSI self-gen for non-firm			0	0	0	0	0
31		Residential exchange		0	0	0	-200	100	-100
32		Residential exchange in-lieu load		-900	-900	0	0	0	-300
33		Load obligation transfer (re BPA conserv.)			0	100	100	500	100
34		Adjusted rest-of-region load	13,300	14,600	14,500	13,600	13,500	14,400	13,900
35									
36		1995 Rate Case resources for 2002	12,000	12,000	12,000	12,000	12,000	12,000	12,000
37		Conservation		700	700	800	800	800	800
38		Combustion turbines		1,700	1,700	700	600	1,500	900
39		Other (effic., renewables, co-gen)		200	200	200	200	200	200
40		Adjusted rest-of-region resources	12,000	14,600	14,500	13,600	13,500	14,400	13,900
41									
42		Adjusted rest-of-region load/resource balance (resources - loads)	-1,300	0	0	0	0	0	0
43									
44	**Whole Region**	Adjusted Loads for 2002	22,300	22,200	21,700	22,500	22,500	22,800	22,500
45		Adjusted Resources for 2002	20,700	23,800	23,600	22,500	22,500	22,800	22,500
46		Adjusted load/resource balance (resources - loads)	-1,600	1,600	1,900	0	0	0	0

*Forecast of Loads and Resources used in Bonneville Power Administration's 1995 Rate Case Initial Proposal.
Note that numbers have been rounded to the nearest 100 aMW; therefore some changes appear as zero.
RC = 1995 Rate Case
RoR = Rest of Region
L/RB =Load/Resource Balance

Notes, table 4.4-8

Lines 2, 3: These are end-use consumer responses to BPA's rates as passed through by BPA's customers in retail electric rates. The judgment of BPA's technical experts was that at least 80 percent of this reduction would take the form of fuel switching, and no more than 20 percent would be conservation. BPA and total regional load change by the same amount, because this change is a price response to BPA's rates affecting only BPA loads. Note that a positive number means an increase in BPA load (i.e., a switch from natural gas to electricity in response to low BPA rates).

Line 4: This line represents a change in the DSI load forecast since the 1995 Rate Case forecast was made.

Line 5: This line represents service to this portion of DSI load as interruptible load in Status Quo and BPA Influence alternatives (balanced by amounts shown in line 13).

Lines 6 and 7: These are BPA load changes resulting from utility and DSI customer decisions, in response to BPA's contract terms and rates, to meet a portion of their load growth with their own new generation (self-generation) instead of with BPA power. While BPA's load changes, total regional load does not. These resources, with other resources built by customers to meet their loads, are shown in line 36. The quantity of customer-developed CTs depends on BPA's rates and contracts, the amount of customer load growth, and the supply of potential CT generation at or below BPA's rate.

Line 8. This is an increase in BPA loads because BPA exercises the "in-lieu" provisions of the residential exchange contracts to serve exchange loads with the BPA surplus that would otherwise exist in those alternatives. The BPA load increase on this line is balanced by a decrease in rest-of-region load on line 32.

Lines 9 and 33: This is a shift of load obligation that BPA had planned to meet with incentive conservation programs, from BPA to BPA's customers. Customers meet this load without BPA program incentives using resources of their choice. Much of this load could be met with conservation based on the Resource Program estimate of 660 aMW of cost-effective conservation in BPA customer loads by 2003.

Line 18: This is BPA-sponsored conservation. Conservation out of the 660 aMW of achievable potential not shown here is shown in line 8 as a shift of load obligation.

Line 21: The power purchases shown here are those identified in the 1992 Resource Program or those needed for planning purposes to balance BPA's loads and resources.

Line 29: These are changes in the loads of residential exchange customers in response to changes in the PF rate passed to residential and small farm end-users under the Residential Exchange Program.

Line 32: These are reductions in the loads of residential exchange customers in three alternatives because BPA exercises the "in-lieu" provisions of the exchange program to serve exchange loads itself with a portion of the BPA surplus that would otherwise exist in those alternatives.

Table 4.4-9: Summary of BPA Firm Load Changes in 2002 Compared With 1995 Rate Case Assumptions (aMW)

	Status Quo	BPA Influence	Market Driven	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
Utility Load Change From Non-BPA Generation	-1,400	-600	0	-100	200	0
Utility Load Change: Price-Induced and Fuel Switching	0	0	0	100	100	0
Shift of Load Obligation	0	0	-100	-100	-500	-100
DSI Load Change From Revised Forecast	200	200	200	200	200	200
Conversion of DSI Firm Load to Interruptible	-300	-800	0	0	0	0
DSI Load Change From Non-BPA-Generation	-800	-1,500	-200	-200	-800	-800
Exchange In-Lieu Load	900	900	0	0	0	300
TOTAL BPA Firm Load Change	-1,400	-1,800	-100	0	-800	-400

Note: Positive number means BPA load increase; negative number means BPA load decrease. Rounding to nearest 100 aMW affects totals.

As table 4.4-9 shows, the Status Quo and BPA Influence alternatives lead to substantial reductions in BPA firm loads, as utilities and DSIs choose non-BPA generation in response to increases in BPA's rates. These load changes are based on the availability of resources at prices below customers' expectations of BPA's rates (see Appendix C). The line labeled "Utility Load Change: Price-Induced and Fuel Switching" reflects (in Maximize Financial Returns and Minimal BPA alternatives) a switch from natural gas to electricity because of low BPA electricity rates. The line labeled "Shift of Load Obligation" reflects a transfer of load from BPA to utility customers of BPA as they implement their own conservation programs under several of the alternatives. The line "DSI Load Change from Revised Forecast" reflects a revision in the DSI forecast since the Rate Case analysis was completed, to reflect more current predictions of higher aluminum prices and higher DSI demand (in all alternatives). The line "Conversion of DSI Firm Load to Interruptible" reflects load that is served as interruptible load in Status Quo and BPA Influence alternatives. It should be noted that load losses in the Status Quo alternative would be even higher than shown in table 4.4-9 except that BPA assumes that in this alternative (as in BPA Influence and Short-Term Marketing), BPA exercises the "in-lieu" provisions of the residential exchange contracts to serve exchange loads of IOUs itself with a portion of the surplus that BPA otherwise would have.

Table 4.4-10: Summary of BPA Firm Load Changes in 2002 Compared With the Status Quo (aMW)

	Status Quo	BPA Influence	Market Driven	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
Utility Load Change From Non-BPA Generation	N/A	800	1,400	1,300	1,600	1,400
Utility Load Change: Price-Induced and Fuel Switching	N/A	0	0	100	100	0
Shift of Load Obligation	N/A	0	-100	-100	-500	-100
DSI Load Change From Revised Forecast	N/A	0	0	0	0	0
Conversion of DSI Firm Load to Interruptible		-500	300	300	300	300
DSI Load Change From Non-BPA-Generation	N/A	-700	600	600	0	0
Exchange In-Lieu Load	N/A	0	-900	-900	-900	-600
TOTAL BPA Firm Load Change	N/A	**-400**	**1,300**	**1,400**	**600**	**1,000**

Note: Positive number means BPA load increase; negative number means BPA load decrease. Rounding to nearest 100 aMW affects totals.

Table 4.4-10 displays the same information as table 4.4-9, but in terms of differences from the Status Quo predicted load losses. It shows that total BPA firm loads are greater than Status Quo loads in all alternatives except for BPA Influence. That alternative incorporates the "DSI Firm Service in Spring Only" module, which leads to the transfer of over half of the DSI load from BPA to self-generation or other non-BPA sources. In other alternatives, BPA's average rates and/or contract terms are such that BPA retains most utility load and some of the DSI loads lost in Status Quo. In addition, BPA does not serve "in-lieu" loads of IOUs (except in BPA Influence and Short-Term Marketing alternatives).

It is important to recognize that conclusions about utilities or DSIs replacing BPA power with non-BPA generation do not apply to all of BPA's wholesale customers. For some utilities, it may not be feasible to purchase non-BPA generation, given the administrative and technical demands of financing, siting, negotiating delivery, securing services, arranging for operation and dispatch, providing reserves, and other requirements for acquisition of non-BPA resources. For these utilities, there may be no practical alternative to continuing to purchase BPA power. Increases in BPA's rates to meet BPA's revenue requirements, such as those noted for the Status Quo alternative, would be passed along to consumers.

In some cases, passing BPA rate increases (such as those in the Status Quo or BPA Influence alternatives) through to retail consumers could cause hardships. Rural utilities with large service territories often have high distribution costs which result in high rates even without the effects of BPA power. Further increases in retail rates could have a variety of consequences, including reductions in loads due to the development of generation by industrial consumers, or closures of marginal industries and businesses unable to absorb increases in power costs.

In extreme cases, the utility itself might not be able to continue as a viable business operation in the face of increased wholesale power costs. A utility in economic distress could voluntarily seek to consolidate with neighboring utilities, or could sell its facilities for new public or private owners to operate. If there were no interested buyers, the management of a distressed utility might be turned over to a receiver or a trustee to control operations and restore stability. In the worst case, it is conceivable that a distressed utility might be relieved of the obligation to serve some high-cost consumers, leaving those consumers without conventional utility service.

4.4.3.3 Resource Development

Resource development among the EIS alternatives is shown in tables 4.4-11 through 4.4-13 and figure 4.4-2. BPA would have surpluses of about 1,600 aMW and 1,900 aMW, respectively, under the Status Quo and BPA Influence alternatives, and load-resource balance under the other alternatives. (The analysis assumed that the rest of the region acquired just enough resources to achieve load-resource balance under medium loads in all other alternatives.) The surpluses are the combined effect of BPA load losses and the completion of acquisitions BPA has previously committed to under its resource acquisition program.

Table 4.4-11 also shows how BPA conservation acquisition varies among the alternatives. In comparing the alternatives, it is important to note the extent to which conservation in BPA loads achieves the target of 660 aMW of cost-effective conservation potential by 2003 that BPA established in its 1992 Resource Program. Because the alternatives differ from the Status Quo in their strategies for conservation, the level achieved in the region must be assessed based on more than the results of BPA programs and market transformation activities. Other influences include energy efficiency codes and standards already in place, utility-sponsored conservation independent of BPA-sponsored programs, and price-induced conservation resulting from rate increases. These influences, and the amounts of conservation achieved by 2002 and by 2003, are shown in table 4.4-14. The table includes the effect of the "Fully Funded Conservation" module on the Market-Driven, Maximize BPA Financial Returns, and Short-Term Marketing alternatives. "Fully Funded Conservation" is intrinsic to the Status Quo and BPA Influence alternatives, and does not apply to the Minimum BPA alternative. Conservation amounts for the year 2003 are also shown because 2003 was the year by which the target was to be achieved, although the study period for this EIS ends in 2002.

As the table shows, the highest level of conservation in BPA loads occurs under the Status Quo and BPA Influence alternatives and the "fully funded" modules on the Market-Driven and Maximum Financial Returns alternatives, with somewhat lesser levels of achievement under the Market-Driven alternative. Under the BPA Influence alternative and the Fully Funded Conservation module, BPA-sponsored region-wide programs would probably take the place of utility-sponsored programs that were expected under all the other alternatives to the Status Quo. Total conservation would be lower under the Short-Term Marketing alternative, still lower under Maximize Financial Returns, and least under the Minimal BPA Marketing alternative, where the absence of BPA-sponsored conservation actions, together with low prices for Federal power, would leave conservation to utility-sponsored programs.

Except in the Status Quo and BPA Influence alternatives, the numerical analysis of alternatives was developed under the assumption that the rest of the region (other than BPA) would develop precisely enough resources to serve the medium forecast loads. This simplifying assumption facilitates comparisons among the alternatives, but actual development is unlikely to match loads so well.

If utilities are acquiring resources independently, there is likely to be some excess development due to imperfect coordination and planning of resources. Some utilities might over-build as a precaution in case loads are higher than the medium forecast. Others might deliberately over-build with the intent to market excess capability until it is needed for the utility's own loads. If too many developers build resources, the market might not be large enough to consume all of the power available. If utilities decide to purchase power rather than developing their own resources, the tendency to over-build might be reduced, as localized surpluses balance out against loads in areas relying on spot market purchases.

An excess of thermal generation might lead to permanent shutdowns of some facilities, leaving the owners to bear the costs of the stranded investment. If the owner of an abandoned resource is a utility, the owners of the utility, whether stockholders or consumers, will likely bear the costs of such stranded investments.

Table 4.4-11: BPA New Resource Acquisitions by 2002 (aMW)

	Alternatives					
Generation/Conservation Resource Types	**Status Quo**	**BPA Influence**	**Market-Driven (Proposed Action)**	**Maximize Financial Returns**	**Minimal BPA**	**Short-Term Marketing**
Conservation	600	600	460	260	130	350
Solar	0	0	0	0	0	0
Muni Solid Waste	0	0	0	0	0	0
Geothermal	60	260	60	60	0	0
Wind	20	120	20	20	0	0
Hydroelectric	0	0	0	0	0	0
Combustion Turbines	300	130	130	130	130	130
Cogeneration	100	100	100	100	100	100
Nuclear	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Efficiency Improvements	50	50	50	50	50	50
Power Purchases	200	0	190	470	0	80
TOTAL	**1,320**	**1,250**	**1,000**	**1,070**	**400**	**700**

Note: Amounts are rounded to nearest 10 aMW, which may affect totals.

Table 4.4-12: Other Utilities' New Resource Acquisitions by 2002 (aMW)

	Alternatives					
Conservation/Generation Resource Types	**Status Quo**	**BPA Influence**	**Market-Driven (Proposed Action)**	**Maximize Financial Returns**	**Minimal BPA**	**Short-Term Marketing**
Conservation	690	690	800	800	800	800
Solar	0	0	0	0	0	0
Muni Solid Waste	0	0	0	0	0	0
Geothermal	40	40	40	40	40	40
Wind	60	60	60	60	60	60
Hydroelectric	0	0	0	0	0	0
Combustion Turbines	1,740	1,660	690	560	1,530	940
Cogeneration	0	0	0	0	0	0
Nuclear	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Efficiency Improvements	80	80	80	80	80	80
Power Purchases	0	0	0	0	0	0
TOTAL	**2,600**	**2,520**	**1,660**	**1,520**	**2,500**	**1,910**

Note: Amounts are rounded to nearest 10 aMW, which may affect totals.

Table 4.4-13: Regional New Resource Acquisitions by 2002 (aMW)

	Alternatives (aMW)					
Conservation/Generation Resource Types	**Status Quo**	**BPA Influence**	**Market-Driven (Proposed Action)**	**Maximize Financial Returns**	**Minimal BPA**	**Short-Term Marketing**
Conservation	1,280	1,280	1,250	1,050	920	1,140
Solar	0	0	0	0	0	0
Municipal Waste	0	0	0	0	0	0
Geothermal	100	300	100	100	40	40
Wind	80	180	80	80	60	60
Hydroelectric	0	0	0	0	0	0
Combustion Turbines	2,040	1,790	820	680	1,660	1,070
Cogeneration	100	100	100	100	100	100
Nuclear	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Efficiency Improvements	120	120	120	120	120	120
Power Purchases	200	0	190	470	0	80
TOTAL	**3,910**	**3,770**	**2,650**	**2,600**	**2,900**	**2,600**
Fuel Switching*	160	210	180	80	50	170

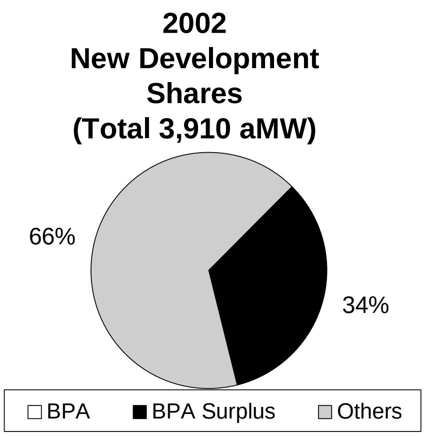
Note: Amounts are rounded to nearest 10 aMW, which may affect totals.

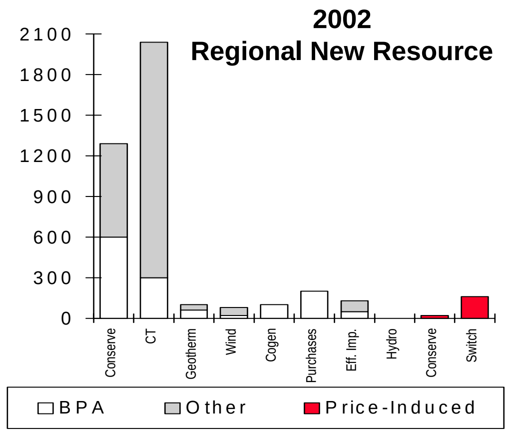
*Tables 4.4-9 and 4.4-10 show BPA firm load changes; the amounts shown here are load *losses* due to fuel switching; the smaller load losses shown here for Maximize Financial Returns and Minimal BPA are the source of the relative load gains to BPA (rounded to the nearest hundred aMW) shown in tables 4.4-9 and 4.4-10.

FIGURE 4.4-2

New Resource Development By 2002*
Based on 1995 Rate Case Load Forecast

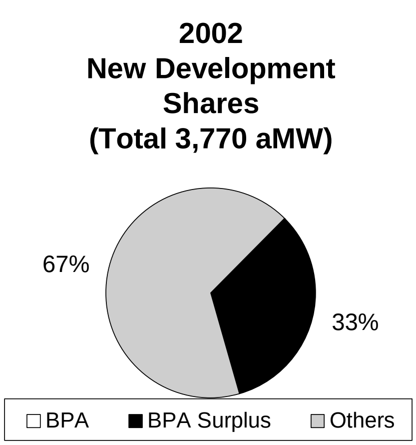
Status Quo

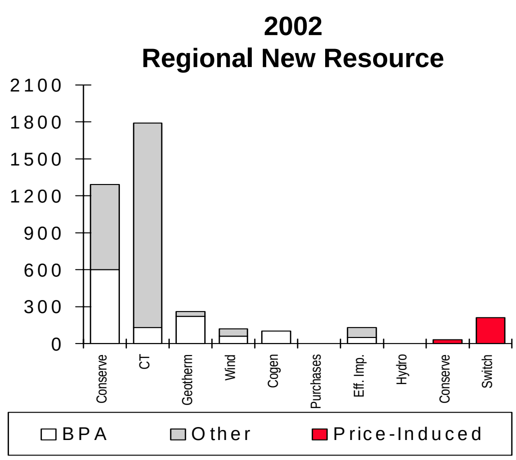




Resource	*BPA*	*Other*
Conservation	* 600	690
CTs	300	1,740
Geothermal	60	40
Wind	20	60
Cogen	100	0
Purchases	200	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		20
Fuel Switch		160

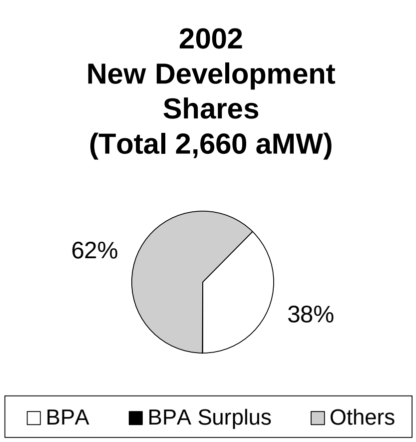
BPA Influence

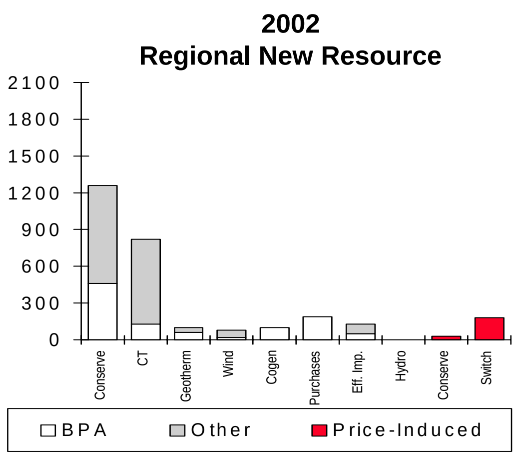




Resource	*BPA*	*Other*
Conservation	* 600	690
CTs	130	1,660
Geothermal	260	40
Wind	120	60
Cogen	100	0
Purchases	0	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		30
Fuel Switch		210

Market Driven BPA





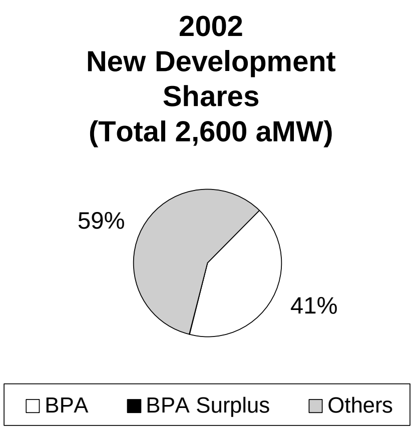
Resource	*BPA*	*Other*
Conservation	* 460	800
CTs	130	690
Geothermal	60	40
Wind	20	60
Cogen	100	0
Purchases	190	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		30
Fuel Switch		180

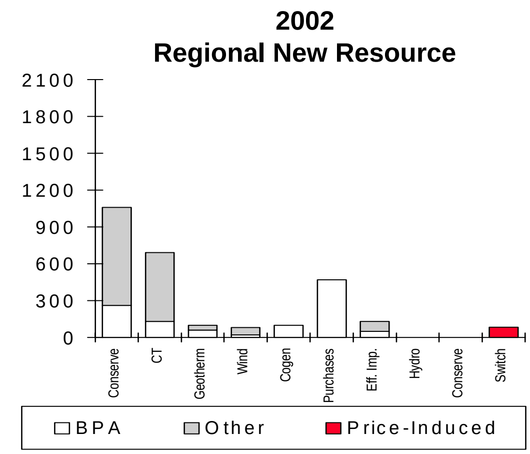
***** The numbers reflected are for 2002. The Status Quo, BPA Influence, and Market Driven alternatives remain committed to the 660 aMW target for 2003: Status Quo 640 aMW BPA-funded and 70 aMW independent utility designed/consumer response; BPA Influence 640 aMW BPA-funded and 90 aMW independent utility designed/consumer response; and Market Driven 480 aMW BPA-funded, and 200 aMW independent utility designed/consumer response.

FIGURE 4.4-2 (continued)

New Resource Development By 2002

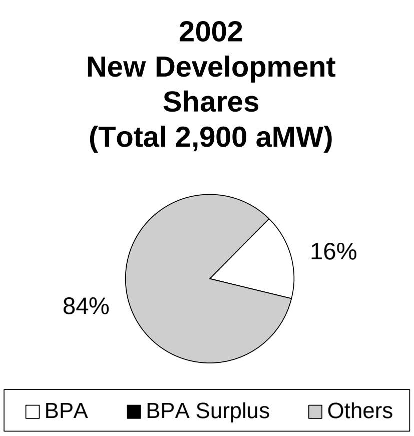
Max Fin Returns

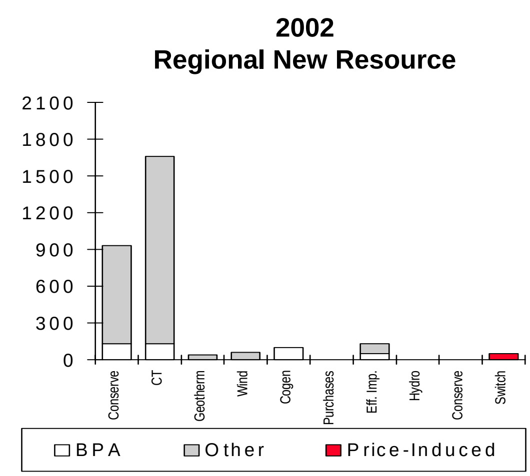




Resource	*BPA*	*Other*
Conservation	260	800
CTs	130	560
Geothermal	60	40
Wind	20	60
Cogen	100	0
Purchases	470	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		0
Fuel Switch		80

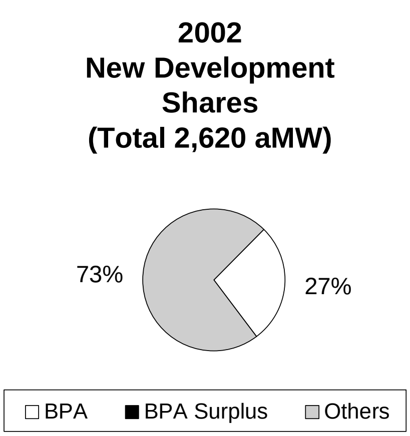
Minimal BPA

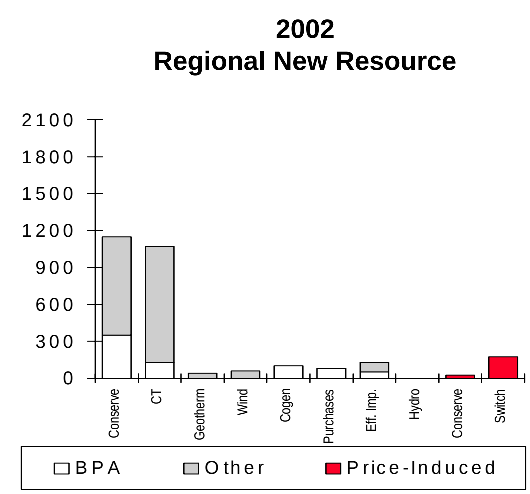




Resource	*BPA*	*Other*
Conservation	130	800
CTs	130	1530
Geothermal	0	40
Wind	0	60
Cogen	100	0
Purchases	0	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		-10
Fuel Switch		50

Short Term Mktg





Resource	*BPA*	*Other*
Conservation	350	800
CTs	130	940
Geothermal	0	40
Wind	0	60
Cogen	100	0
Purchases	80	0
Eff Improve	50	80
Hydro	0	0
Price-Induced:		
Conservation		20
Fuel Switch		170

Table 4.4-14: Breakdown of Energy Conservation in BPA Loads by 2002 and by 2003 (aMW)
(With and Without "Fully Funded Conservation" Module)

Source of Conservation	Status Quo	BPA Influence	Market-Driven	Market-Driven with "Fully Funded" Conservation Module	Maximize Financial Returns	Maximize Financial Returns with "Fully Funded" Conservation Module	Minimal BPA	Short-Term Marketing	Short-Term Marketing with "Fully Funded" Conservation Module
Already Achieved by FY 1993	80	80	80	80	80	80	80	80	80
Committed Under Existing BPA Programs	200	200	200	200	0	200	0	200	200
Additional BPA Efforts	270	250	0	140	0	140	0	0	250
BPA Market Transformation	0	20	20	20	20	20	0	20	20
Effect of Enacted Codes and Standards	50	50	50	50	50	50	50	50	50
BPA TOTAL	**600**	**600**	**350**	**490**	**150**	**490**	**130**	**350**	**600**
Independent Utility Programs	**20**	**20**	**130**	**20**	**130**	**20**	**130**	**130**	**20**
BPA Energy Service Products[2]	0	0	110	110	110	110	0	0	0
Price-Induced Consumer Actions[3]	20	30	30	30	0	0	-10	20	20
Potential Lost to Fuel-Switching[2]	20	20	20	20	10	30	0	20	20
NON-BPA TOTAL	**60**	**70**	**290**	**180**	**250**	**160**	**120**	**170**	**60**
TOTAL CONSERVATION FOR BPA LOADS IN 2002	**660**	**670**	**640**	**670**	**400**	**650**	**250**	**520**	**660**
TOTAL CONSERVATION FOR BPA LOADS IN 2003[4]	**710**	**730**	**680**	**710**	**430**	**660**	**270**	**560**	**710**

Note: Rounding to nearest 10 aMW affects totals and subtotals.

[2] BPA Energy Service Products support utility programs, so are listed separately from the BPA total. "Potential Lost to Fuel Switching" is conservation potential included in the Council's goal that is no longer available because the electrical load to be made more efficient through conservation has switched to natural gas.

[3] Price-induced load changes and fuel switching are net of Status Quo amounts projected in the 1995 Rate Case.

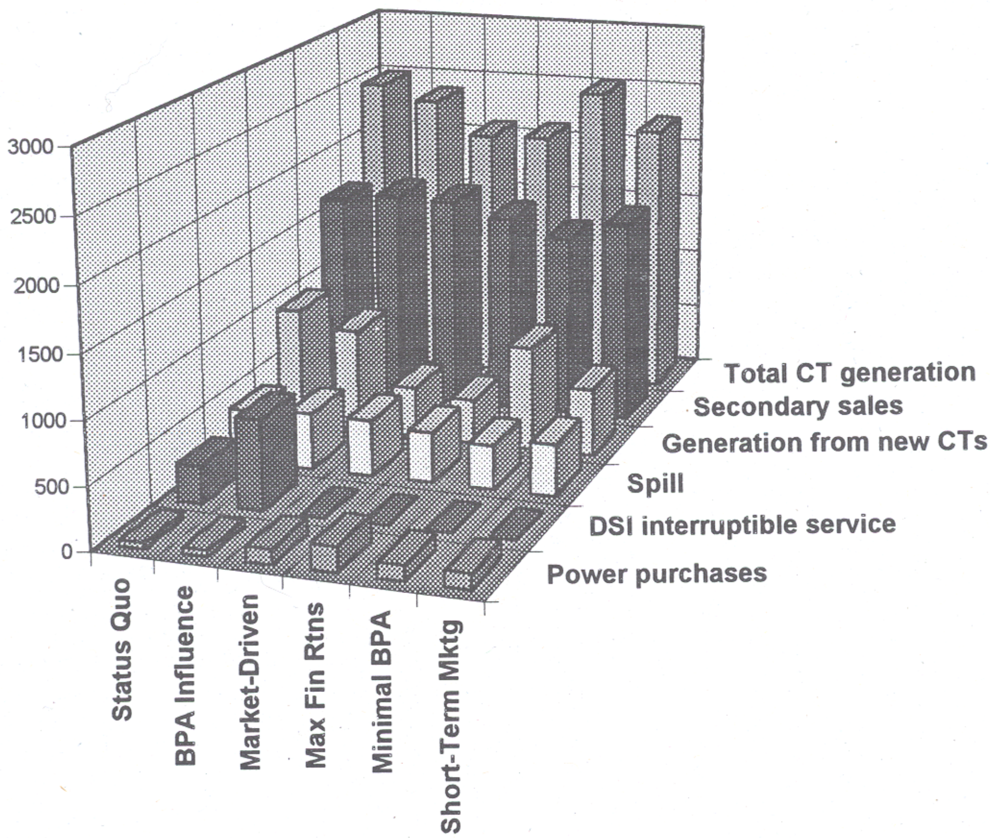
[4] Projected total conservation in 2003.

4.4.3.4 Resource Operations

Figure 4.4-3 and table 4.4-15 show resource operations across the alternatives.

Resource operations vary across the alternatives in the total amount of generation from CTs, the amount of BPA secondary energy sales, the amount of spill that occurs at hydro generating projects, the power available to the DSI top quartile (in Status Quo and BPA Influence alternatives only), and the amount of operating year purchases BPA makes to meet loads. Streamflow significantly affects operations, as nonfirm hydro displaces thermal generation from CTs and other displaceable thermal generation.

Figure 4.4-3: Regional Operations Summary



Notes, figure 4.4-3:
For each alternative, these output variables were averaged over the 14 operating periods in 2002 (formerly 2003) and averaged over 50 different hydro years.
Total CT Generation: Average MW produced by all high-cost resources = new CTs + existing high-cost thermals (mainly CTs but also including import contracts for this analysis).
Secondary Sales: Average sales of nonfirm energy to California.
Generation From New CTs: Average MW of generation from CTs built by BPA or others to meet load growth between now and 2002 (formerly 2003).
Spill: Average amount of power not able to be sold. (Tools used in the BP EIS did not reflect all actual markets, especially low-cost thermal displacement market. Most spill reported occurs April through June.)
DSI Top Quartile Service: Average MW of energy supplied to DSI top quartile (nonfirm portion of DSI load). Size of top quartile varies across alternatives.
Power Purchases: Average quantities of energy purchased from the spot market during operations under specific hydro conditions. (Not the same as the amount of *planned* power purchases included in load/resource balances.)

Table 4.4-15: Operations of Thermal Generation, Power Purchases, Spill, and DSIs (aMW)

Parameter	Status Quo	BPA Influence	Market-Driven (Proposed Action)	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
Spill	**400**	**500**	**500**	**400**	**300**	**400**
Alum. DSI Firm Load (a)	1,500	400	2,300	2,300	1,800	1,700
Non-Alum. DSI Firm Load (a)	100	0	200	200	200	200
Alum. DSI Top Quartile Service (a)	300	700	0	0	0	0
Non-Alum. DSI Top Quartile Service (a)	0	100	0	0	0	0
Alum. DSI Ops. from Self-Gen. (a)	700	1,400	200	200	700	700
Non-Alum. DSI Ops. from Self-Gen. (a)	100	100	0	0	100	0
Total Alum. DSI Operations.	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**
Total Non-Alum. DSI Operations	**200**	**200**	**200**	**200**	**200**	**200**
Total DSI Operations	**2,700**	**2,700**	**2,700**	**2,700**	**2,700**	**2,700**
Older CTs	1,500	1,500	1,700	1,700	1,700	1,700
Coal	3,200	3,100	3,400	3,500	3,400	3,400
Newer CTs	1,000	800	400	400	900	600
WNP-2	900	900	900	900	900	900
Total Thermal Operations	**6,500**	**6,300**	**6,400**	**6,500**	**6,900**	**6,600**
Operating Year Purchases	**0**	**0**	**100**	**200**	**100**	**100**
Secondary Sales	**1,700**	**1,800**	**1,700**	**1,600**	**1,500**	**1,600**

Note: Loads rounded to nearest 100 aMW (thus some positive numbers round to zero).
(a) DSI loads from 1993 Pacific Northwest Loads and Resources Study, table 2 plus predicted load changes for each alternative.

The potential for termination of existing resources due to operating costs above market prices could alter these values, necessitating replacement power purchases.

4.4.3.5 Capacity

The analysis of resource operations above addresses only operations to meet firm energy requirements and to market any surplus capability. Although peak demands might present different issues of resource operations, there is insufficient evidence of changes in the hourly demands on BPA's system to infer that there would be significant peak resource development or operations impacts in any of the alternatives.

BPA's ability to make long-term extraregional sales of products and/or services is restricted by the provisions of the regional preference act (Public Law 88-552). The load within the region is being met adequately with its current resources, and it is not yet clear that unbundling of power products and services or other BPA marketing efforts would significantly change the basic hourly load shape of the region. For example, if a BPA customer currently purchasing shaped energy from BPA decides to purchase flat energy somewhere else and purchase shaping only from BPA, its load shape does not change. The customer will have approximately the same need for shifting energy into peak periods as when it was purchasing shaped energy from BPA. The shaping burden the BPA system would have to meet would probably not be substantially different.

In the event that capacity or shaping demand begins to outstrip BPA's capability, some options for meeting the demand are more attractive than resource development. The first response, in the short term, would be increased spot-market purchases. Longer-term responses would probably place DSM ahead of resource acquisitions. For example, in most other regions of the country, resource development is driven by the need to meet the highest single-hour load a utility will face. This gives the utility a strong incentive to pursue DSM tools that reduce the magnitude of the single-hour peak. Many such peak-management measures have been developed, and the utility industry has accumulated a lot of experience with some. Few of these have been implemented in this region, so even the lowest-cost and most easily implemented DSM savings have not been developed in the PNW. Time-of-use rates alone could probably flatten PNW peak loads substantially. DSM efforts are likely to be the most attractive choice if BPA needs to increase its shaping capability or sustained peaking capacity.

One factor that affects BPA's capacity is the level of nighttime load. When nighttime loads are not much greater than minimum flow requirements, the system has little ability to take in energy at night to store for use in the next heavy-load period, and may have to spill energy received at night. While this does not affect the system's ability to meet peak loads, it affects its ability to derive benefits from energy received at night; it might may require purchasing energy within the next month to replace the energy delivered on peak that could not be returned at night.

The level of DSI load is a major variable in the level of Federal system nighttime loads because this load is large, and it is flat (constant around the clock). Compared to the Status Quo alternative, the total DSI loads on BPA decrease in the BPA Influence alternative by almost 700 aMW, and increase in the Market-Driven and Maximize Financial Returns alternatives by 1,300 aMW and by 100 aMW in the Minimal BPA alternative. For the Short-Term Marketing alternative, DSI loads stay the same as under Status Quo. This means that it could be easier to utilize nighttime energy in alternatives other than Status Quo, BPA Influence and Short-Term Marketing. (See table 4.4-18 in section 4.4.3.7).

4.4.3.6 Transmission System Development and Operation

Figure 4.4-4 and table 4.4-16 show the amount of major transmission line development by BPA and other parties expected under each of the alternatives. Projections include additions to the interconnected transmission system in the Northwest Power Pool (NWPP) area (all of Washington, Oregon, Idaho, Montana, Utah, British Columbia, Alberta, most of Nevada, and western Wyoming).

FIGURE 4.4-4

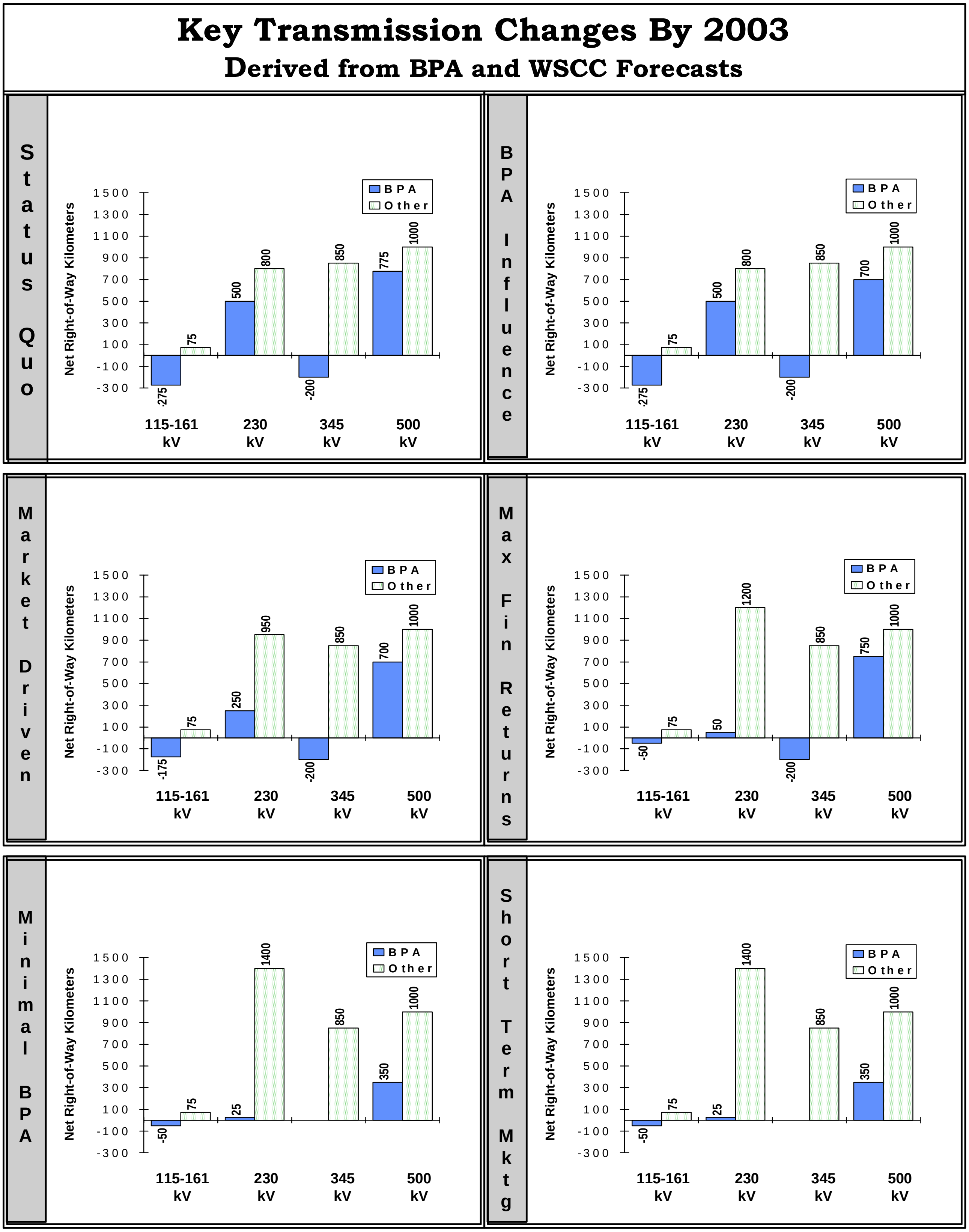

Key Transmission Changes By 2003
Derived from BPA and WSCC Forecasts
Status Quo
BPA Influence
Market Driven
Max Fin Returns
Minimal BPA
Short Term Mktg
Net Right-of-Way Kilometers
1500
1300
1100
900
700
500
300
100
-100
-300
BPA
Other
115-161 kV
230 kV
345 kV
500 kV
-275
75
500
800
-200
850
775
1000
700
-175
250
950
-50
50
1200
750
25
1400
350

Table 4.4-16: Summary of Significant Transmission Additions in the Northwest Power Pool Area by 2002 (Net Right-of-Way Kilometers)

Transmission Voltage Class	Status Quo			BPA Influence			Market-Driven (Proposed Action)		
	BPA	Other	Region	BPA	Other	Region	BPA	Other	Region
115-161 kV	-275	75	-200	-275	75	-200	-175	75	-100
230 kV	500	800	1,300	500	800	1,300	250	950	1,200
345 kV	-200	850	650	-200	850	650	-200	850	650
500 kV	775	1,000	1,800	700	1,000	1,700	700	1,000	1,700
Total	800	2,725	1,800	725	2,725	1,700	575	2,875	1,700

Transmission Voltage Class	Max. Financial Returns			Minimal BPA			Short-Term Marketing		
				BPA	Other	Region	BPA	Other	Region
	BPA	Other	Region	BPA	Other	Region	BPA	Other	Region
115-161 kV	-50	75	25	-50	75	25	-50	75	25
230 kV	50	1,200	1,250	25	1,400	1,425	25	1,400	1,425
345 kV	-200	850	650	00	850	850	00	850	850
500 kV	750	1,000	1,750	350	1,000	1,350	350	1,000	1,350
Total	550	3,125	3,675	325	3,325	3,650	325	3,325	3,650

Note: Negative numbers indicate net kilometers of line taken out of service (typically for upgrading to a higher voltage)

Source: Compiled from WSCC "Coordinated Bulk Power Supply Program" 1992-2002, Reply to U.S. Department of Energy Form OE-411, April 1, 1993; "BPA Transmission System Facilities Ten-Year Development 1993-2003," Office of Engineering, September, 1993; and draft updates provided from BPA to WSCC in March 1994.

The projections were drawn from WSCC and BPA 10-year plans for the NWPP area. The amounts of transmission facilities represent kilometers of new construction; they do not include projects for which only a change in operating voltage is required. Amounts represent right-of-way kilometers, not circuit kilometers; in several cases, projects remove an existing single-circuit, lower-voltage line and replace it with a double-circuit, higher-voltage line. Negative numbers mean that more kilometers of that voltage are removed than constructed. Projects labeled "tentative" were not included. In addition, local transmission and subtransmission additions are not included in these projections—only transmission additions to the interconnected system. It should be noted that the amounts of proposed development in table 4.4-16 reflect a predominant role for BPA in regional 500-kV transmission development. The 850 kilometers of 345-kV and 1,000 kilometers of 500-kV transmission facilities shown for other utilities all represent proposed intertie projects linking the PNW to other regions; those projects are assumed to occur in all alternatives.

The table shows that, while BPA's share of new regional transmission development is reduced by as much as 60 percent in some alternatives, overall development in the region varies only by about 6 percent.

4.4.3.7 Consumer Behavior

Retail Sector Rate Effects

The effect on bills of ultimate consumers is difficult to predict with any degree of accuracy. Retail rate effects for a particular utility would depend on the ratio of BPA-purchased power costs to total costs and the total kWh sales for the utility. For example, if BPA-purchased power costs represented 50 percent of a full requirements customer's total costs, then a 10-percent increase in power costs would lead to a 5-percent increase in the utility's total costs. Hypothetical retail rates for consumers of two types of BPA customers are shown in table 4.4-17.

Table 4.4-17: Retail Price Effect of BPA Rate Changes (Hypothetical) (mills/kWh)

Alternative	Status Quo	BPA Influence	Market-Driven BPA	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
Hypothetical Full Requirements Customer[1]	53-59	51-57	50-56	50-56	49-55	50-56
Hypothetical Partial Requirements Customer[2]	30-36	30-36	29-35	29-35	29-35	29-35

[1] 100 percent of power purchased from BPA.

[2] 50 percent of power purchased from BPA.

DSI Load Effects

The changes in aluminum smelter loads resulting from increases in BPA's electric rates were estimated relative to the BPA 1995 Rate Case long-term forecast. The changes in DSI firm and nonfirm loads compared to the 1995 Rate Case loads are in table 4.4-18 below.

Table 4.4-18: BPA DSI Load Change Relative to the 1995 Rate Case (aMW in 2002)

	Status Quo	BPA Influence	Market Driven	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
BPA DSI Firm Load Change From Revised Forecast	200	200	200	200	200	200
Conversion of DSI Firm Load to Interruptible	-300	-800	0	0	0	0
BPA DSI Firm Load Change From Non-BPA-Generation	-800	-1,500	-200	-200	-800	-800
DSI Load Served As Interruptible	300	800	0	0	0	0
Total BPA DSI Load	**-600**	**-1,300**	**0**	**0**	**-600**	**-600**
Total DSI Loads	**2,700**	**2,700**	**2,700**	**2,700**	**2,700**	**2,700**

Note: Positive number means BPA load increase; negative number means BPA load decrease.

Aluminum smelter firm loads increased by approximately 200 aMW under all alternatives because DSI load information was updated from the information used in the 1995 Rate Case to reflect a higher expected load for the DSIs. In addition, in all alternatives, based on the availability of power from other sources at relatively low prices, it is assumed that if DSIs are not served by BPA, they can find competitive sources of electricity from non-BPA sources. Therefore, in all alternatives it is assumed that DSI output and total DSI load does not change, even if in some alternatives BPA DSI loads decline.

The Status Quo alternative is similar to the 1995 Rate Case (base), except that, in this alternative, BPA continues to provide DSI top quartile service (as in current DSI contracts). At the same time, the increase in BPA's rates overall, and the DSI VI rate in particular, cause approximately 800 aMW of DSI load to shift load away from BPA and to be served instead by self-generation or other suppliers.

Under the BPA Influence alternative, DSIs are offered firm service only in the spring, when Columbia River system flows are high. BPA DSI firm loads are reduced to the amount served as firm (about one-third of their total BPA load). The remainder of their load is assumed to be served by self-generation or by other suppliers. The DSI load BPA serves is less than half of the total DSI load in the region, but only about a third of the diminished BPA load is firm, due to interruptible service to the entire BPA load outside of the spring flow period.

The Market-Driven alternative has tiered rates in the long term (in the short term, rates are implemented without tiered rates), with a Tier 2 rate that DSIs generally would be unwilling to pay; in addition, the amount of firm service offered to DSIs from Tier 1 power will decline over time in order to provide additional Tier 1 power to preference customers. Nonetheless, because in this alternative BPA is able to keep rates lower than in Status Quo, BPA is able to retain approximately 600 aMW of the load loss to other power sources that occurs in Status Quo.

In the Maximize Financial Returns alternative, BPA offers the DSIs contracts providing for 100-percent firm service. Because of cost-cutting and the elimination of programs that do not produce a short-term financial return, BPA is able to reduce rates and retain DSI load, retaining 600 aMW of loads lost in the Status Quo alternative.

In the Minimal BPA alternative, BPA does not acquire significant new resources to serve load. The DSIs are offered firm service to the extent firm power is available after preference customer firm loads are met. Over time, with BPA not making resource additions, the amount of firm power available to DSIs declines, and BPA loses 600 aMW of DSI loads (the same as in Status Quo).

In the Short-Term Marketing alternative, BPA offers only short-term firm contracts, offers DSIs declining Tier 1 firm service, and prices Tier 2 power at a market-based rate. New resource acquisitions to serve firm load are almost as low as in the Minimal BPA alternative. DSI load losses are as great as in Status Quo (that is, approximately 600 aMW).

4.4.3.8 Environmental Impacts

Environmental impacts of alternatives were assessed by linking the market responses identified above in section 4.4.2 (e.g., new generation and conservation development and operations and transmission development) with the generic environmental impacts described in section 4.3.

Key regional environmental impacts are shown in table 4.4-19 and in figure 4.4-5.

Differences in impacts among the EIS alternatives are dominated by impacts of the operation of thermal generation, including existing coal and CTs, and new CTs.

The major influences on the cumulative impacts of the alternatives are the following:

- Impacts of generation are affected most by the amount of load and the types of generation operated.
- Impacts tend to be less under alternatives with small loads. The smaller regional loads are, the smaller the environmental impacts of meeting loads.
- DSI operations and environmental impacts are projected to be the same under all alternatives (although the share of their load served by BPA varies by alternative).
- Impacts are less under alternatives with more total regional conservation. For a given load level, the more conservation or cleaner generating resources are used, the smaller the impacts of meeting load. Most expected new generating resources for the next decade are either conservation or gas-fired CTs. Since conservation has few adverse impacts, the more conservation is developed, through either BPA-sponsored or independent utility efforts, the smaller the impacts of meeting load.

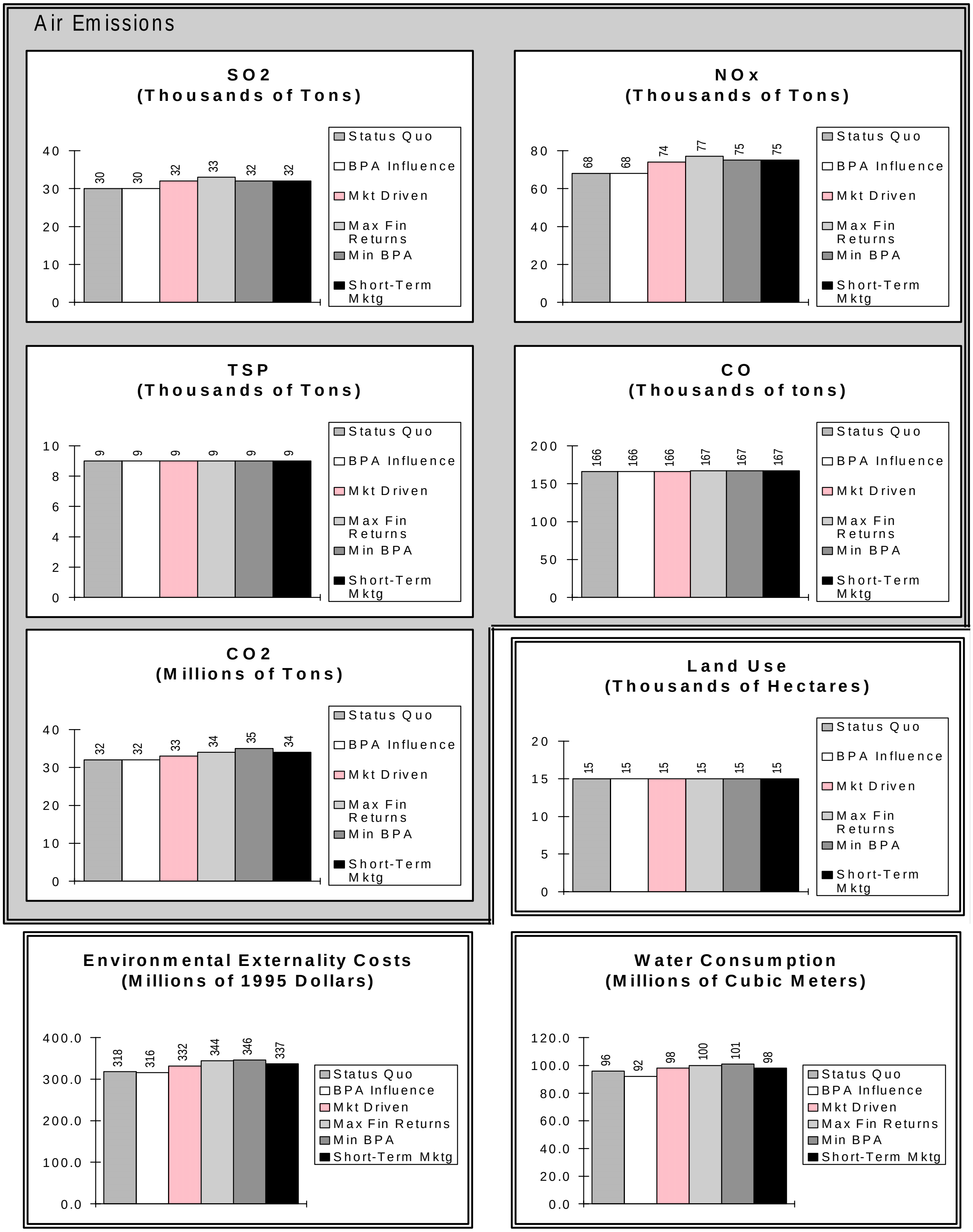
Table 4.4-19: Key Environmental Impacts of Alternatives Under 1994-1998 Biological Opinion Hydro Operation

Effect	Unit	Status Quo	BPA Influence	Market Driven (Proposed Action)	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
New Resource Development (Impacts From the Operation of New Generating Resources)							
SO2 (a)	Tons	0	0	0	0	0	0
NOx (a)	Tons	400	400	200	200	400	300
TSP (a)	Tons	200	100	100	100	100	100
CO (a)	Tons	600	500	300	200	500	400
CO2 (a)	Tons	3,233,000	2,813,000	1,375,000	1,203,000	2,988,000	1,991,000
Water Consumption (a)	Cubic Meters	4,093,000	3,561,000	1,740,000	1,522,000	3,783,000	2,520,000
Land Use (b)	Hectares	900	1,900	800	800	700	700
Existing Generating Resources (Impacts From the Operation of Existing Thermal Resources)							
SO2 (c)	Tons	27,300	27,400	29,400	30,200	29,400	29,400
NOx (c)	Tons	76,000	74,800	82,100	84,500	82,100	82,100
TSP (c)	Tons	4,130	4,150	4,450	4,580	4,450	4,450
CO (c)	Tons	7,890	7,920	8,590	8,870	8,590	8,590
CO2 (c)	Tons	33,245,000	33,783,000	35,966,000	37,045,000	35,969,000	35,969,000
Water Consumption (c)	Cubic Meters	65,258,000	65,562,000	69,137,000	70,675,000	69,141,000	69,141,000
Hydro Operations							
Spill (d)	aMW	430	460	500	410	300	420
Power Sales and Purchases (Impacts From Net Changes in Regional and Extraregional CT Operations)							
SO2 (e)	Tons	0	0	0	0	0	0
NOx (e)	Tons	-8,600	-9,200	-8,500	-7,500	-7,200	-8,000
TSP (e)	Tons	0	0	0	0	0	0
CO (e)	Tons	-3,300	-3,500	-3,300	-2,900	-2,800	-3,100
CO2 (e)	Tons	-5,778,000	-6,203,000	-5,693,000	-5,045,000	-4,853,000	-5,409,000
Water Consumption (e)	Cubic Meters	-6,840,000	-7,343,000	-6,739,000	-5,972,000	-5,746,000	-6,916,000
Aluminum DSIs							
SO2 (f)	Tons	2,600	2,600	2,600	2,600	2,600	2,600
NOx (f)	Tons	0	0	0	0	0	0
TSP (f)	Tons	4,400	4,400	4,400	4,400	4,400	4,400
CO (f)	Tons	160,300	160,300	160,300	160,300	160,300	160,300
CO2 (f)	Tons	834,000	834,000	834,000	834,000	834,000	834,000
Water Consumption (f)	Cubic Meters	33,741,000	33,741,000	33,741,000	33,741,000	33,741,000	33,741,000
Transmission Development							
Land Use (g)	Hectares	14,300	14,000	13,900	14,700	14,300	14,300
Consumer Behavior							
Employment Change (h)	Percent	1.90%	NSSC	NSSC	NSSC	NSSC	NSSC
Fuel Switching Air Emissions							
NOx (i)	Tons	400	500	400	200	100	400
CO (i)	Tons	200	200	200	100	100	200

Notes, **table 4.4-19:**
NSSC = No statistically significant change.
(a) Emissions from new CTs; new resource operations from table 4.4-15 emissions coefficients from table 4.3-1 (new CTs).
(b) Includes all resource types; new resource acquisitions from table 4.4-13 land use coefficients from table 4.3-1.
(c) Emissions from existing CTs and coal; existing operations from table 4.4-15; emissions factors from table 4.3-1 (older CTs and coal).
(d) Spill at Federal hydro projects, from table 4.4-15.
(e) Reductions in emissions from CTs displaced by surplus sales from the PNW minus power purchases; secondary sales and purchases from table 4.4-15; (older CTs) emissions factors from table 4.3-1.
(f) Aluminum operations served as DSI firm, top quartile, and self-generation from table 4.4-15; emissions factors from table 4.3-1.
(g) Land use associated with new BPA and non-BPA regional transmission lines; transmission line miles from table 4.4-16; land use coefficients from table 4.3-1.
(h) Status Quo amount (1.9%) is annual regional employment growth in 2003; no statistically significant changes in employment growth rates among alternatives.
(i) Air emissions from fuel switching based on amount of fuel switching (table 4.4-13) and fuel switching air emissions coefficients (table 4.3-1); offsetting reduction in power plant operations included in New Resource Development entries.

FIGURE 4.4-5

Summary of Key Regional Environmental Impacts



Employment impacts **had no statistical difference across alternatives.**

Alternatives that show higher operations of existing coal resources tend to have higher overall environmental impacts. Paradoxically, in those alternatives with higher new CT acquisition (e.g., Status Quo and BPA Influence), the impacts on air from the operation of thermal generation are less, because the surplus firm power in those alternatives is used to displace older, higher-cost, dirtier coal resources (such as Valmy, Centralia, and Boardman). Alternatives with lower new thermal generating resource acquisition (such as Market-Driven BPA and Maximize Financial Returns) show higher thermal operation impacts (because more coal is operated).

Impacts of new conservation and generation resource development and operation are represented by estimates of air quality impacts and water consumption (for cooling) from the operation of new CTs and land use by all new generation resources. These estimates were developed by multiplying the emissions factors for new natural-gas fired CTs in table 4.3-1 by the amounts of new CT operations shown in table 4.4-15. Land use impacts were estimated by multiplying the land use requirements for each type of new generation resource shown in table 4.3-1 by the regional resource acquisitions shown in table 4.4-13.

Impacts of existing generating resource operation are of four types: air emissions from existing PNW CTs; air emissions and water use from existing regional coal resources; water use by existing regional nuclear plants (WNP-2); and operations and spill on the PNW hydroelectric system. CT and coal emissions shown in table 4.4-19 were developed by multiplying the amounts of existing regional CT and coal operations shown in table 4.4-15 by the emissions factors for existing CTs and coal shown in table 4.3-1. Spill is taken from table 4.4-15, and is based on BPA modeling of each alternative.

Impacts of power sales and purchases are represented by estimates of changes in emissions by CTs. It is assumed for purposes of analysis that secondary power sales from the PNW would occur during periods of high flows, when there is excess hydroelectric energy on the PNW system. It is likely that these secondary sales (shown in table 4.4-15) would displace thermal resources in California or the Inland Southwest. Power purchases (as shown in table 4.4-15, power purchases represent much smaller amounts) are assumed to be supported by thermal generation. The air emissions shown for power sales and purchases in table 4.4-19 were developed by subtracting secondary sales from power purchases and multiplying the net amount by the emissions factors for existing CTs shown in table 4.3-1. The negative numbers in table 4.4-19 reflect the fact that the analysis predicts that more CTs would be displaced (probably in California and the Inland Southwest), than would operate to support power purchases by the PNW.

Impacts of transmission development are represented by the amounts of land required for new right-of-way development. These numbers are derived by multiplying the amounts of new transmission predicted for each alternative (measured in kilometers of transmission lines of each voltage class) (table 4.4-16) by the coefficients for land use requirements for new transmission shown in table 4.3-1. It should be noted that the estimates of the land use requirements for new transmission facilities assume that new rights-of-way could be widened to accommodate new or higher-voltage lines; therefore, the land use estimates in table 4.3-1 may be higher than would actually occur.

Impacts from the operation of new transmission lines are difficult to predict; perhaps the chief impact of public concern, EMF, varies considerably by line configuration and line loadings. In addition, human exposure to EMF also depends on the location of the transmission facilities and the presence of other EMF sources. Because of the difficulty of predicting EMF for transmission facilities that have not yet been designed, impacts of transmission operations are not addressed here (see section 4.3.2 for general information about such impacts.)

Impacts associated with consumer behavior are represented by information on predicted changes in regional employment growth rates and the air quality impacts associated with fuel switching. Fuel switching air quality impacts were derived by multiplying the predictions of regional fuel switching (table 4.4-13) by the emissions factors for fuel switching shown in table 4.3-1. Fuel switching air emissions represent the emissions that result from combustion of natural gas in home water heaters and furnaces. It should be understood that the fuel switching also leads to a reduction in air emissions by reducing the amount of thermal generation to produced electricity. This positive effect of fuel switching is captured in the numbers reported for air emissions from new thermal generation in table 4.4-19. Those numbers would be substantially higher if fuel switching were not reducing the need for new generating resources by an amount reflecting the amount of fuel switching predicted for each alternative.

The key environmental impacts shown in table 4.4-19 are summarized in table 4.4-20 and figure 4.4-5 in terms of overall effects on air, land, water, and socioeconomics. The air entries in table 4.4-20 reflect the total of air quality impacts associated with the operation of aluminum DSIs, existing coal, existing and new CTs, fuel switching, extraregional sales (i.e., the displacement of CT operations), and power purchases (operations of CTs). The land use entry adds the land use impacts of new transmission and new generation. Water impacts are represented by the sum of cooling water requirements for aluminum DSIs, coal, new and existing CTs, existing nuclear (WNP-2), and power purchases (assumed to be CT operations); and the reduction of water requirements resulting from the displacement of CT operations by extraregional sales. Socioeconomic impacts are represented by predicted changes in regional employment growth rates (as noted above, no statistically significant differences are noted among the alternatives).

The final row of table 4.4-20 summarizes environmental externality costs of SO_X, NO_X, TSP, and $C0_2$ emissions from aluminum DSIs, existing coal, existing and new CTs, fuel switching, extraregional sales (i.e., the displacement of CT operations), and power purchases (operations of CTs), as shown in the top part of the same table. The environmental externality estimates are those BPA developed and published in 1991, inflated to 1995 dollars.

Economic Impacts

The economic analysis to predict regional employment change assumed a base case (Status Quo) that was described by Bonneville's Economic and Demographic Forecasts of the Pacific Northwest, completed in July 1993. These projections defined a most likely forecast for employment, population, and income for Idaho, Oregon, Washington, and western Montana, and defined the medium case forecasts used for final Rate Case analyses and incorporated into the 1995 Rate Case.

Potential economic effects (positive or negative) of the alternatives primarily are caused by changes to the rates charged for electricity to consumers, businesses, and industry. Rates trends of each of the alternatives are documented in section 4.4.3.1.

In Status Quo, economic performance in the Pacific Northwest is expected to continue to outpace the nation over the period 1993 to 2002. Total employment growth in the region is expected to average about 2.2 percent per year from 1993 to 1996 and about 1.9 percent per year from 1996 to 2002. Growth for the U.S. is expected to average 2.0 percent and 1.7 percent over the same periods.

Total employment in the region is expected to grow from about 4.1 million in 1993 to over 4.6 million in 1996 and exceed 5.2 million in 2002. Population is expected to grow from about 9.7 million in 1993 to about 10.2 million in 1996 and exceed 11.1 million by 2002. Relatively higher birth rates, solid economic conditions, and continuing in-migration from California will fuel the population growth.

These projections were based on medium-case forecasts of the U.S. and world economies and assumed, among other things, that there would be limited timber harvesting in the region, as well as continuing downswing at Boeing. It was also assumed that electricity rates in the region would grow at the pace defined by Bonneville's Power and Transmission Rate Projections for 1993 to 2014.

The regional economic projections assumed that the 1992 Resource Program would continue and that the resources to be built would follow the pattern described in that document. Much of the additional money raised by Bonneville through higher rates would be re-spent in the region for conservation, generation, transmission, and fish and wildlife expenditures. This re-spending provides economic stimulus to offset the relative costs of higher rates.

This forecast has a near-term range of uncertainty of about 2 percent. Over the longer term the range of uncertainty grows to roughly 8 percent. This uncertainty includes the typical effects of the business cycle, national factors, and structural assumptions for the region.

The economic impact analysis concluded that none of the alternatives would cause economic effects large enough to result in any statistically significant changes to the predicted regional employment growth rate of 1.9 percent over the period 1996-2002.

Table 4.4-20: Summary of Key Environmental Impacts of Alternatives[(a)] Under 1994-1998 Biological Opinion Hydro Operations

Effect	Unit	Status Quo	BPA Influence	Market Driven (Proposed Action)	Maximize Financial Returns	Minimal BPA	Short-Term Marketing
Air							
SO2	Tons	30,000	29,000	32,000	33,000	32,000	32,000
NOx	Tons	68,000	66,000	74,000	77,000	75,000	75,000
TSP	Tons	9,000	9,000	9,000	9,000	9,000	9,000
CO	Tons	166,000	165,000	166,000	167,000	167,000	165,000
CO2	Tons	32,000,000	31,000,000	33,000,000	34,000,000	35,000,000	34,000,000
Land							
Land Use	Hectares	15,000	16,000	15,000	15,000	15,000	15,000
Water							
Water Consumption	Cubic Meters	96,000,000	95,000,000	98,000,000	100,000,000	101,000,000	98,000,000
Socioeconomics							
Employment Change	Percent	1.9	NSSC	NSSC	NSSC	NSSC	NSSC
Environmental Externalities (b)	$ (1995)	$318,000,000	$308,000,000	$332,000,000	$344,000,000	$348,000,000	$339,000,000

NSSC = No statistically significant change.
(a) Summary of data in table 4.4-19.
(b) Monetized environmental externalities for SOx, NOx, TSP, and CO_2.

BPA Environmental Externality Estimates ($1995)		
	$/lb	**$/metric ton**
SOx	$0.9099	$1,651
NOx	$0.2890	$524
TSP	$0.5175	$939
CO_2	$0.0039	$7

Source: BPA final values for environmental costs, issued May 20, 1991, (escalated to $1995), except for CO_2 estimate, which is from draft values.

4.4.4 Market Responses and Impacts of Alternatives Under Detailed Fish Operating Plan (SOS 9a)

The following subsections describe Business Plan EIS alternative market responses and environmental impacts assuming that current hydroelectric operations are replaced by a strategy designed to increase flows and spill and to implement drawdown to aid anadromous fish migration. Characteristics of such a strategy (as developed by the System Operation Review and described in the Draft SOR EIS) are described in section 2.1.6 and at the end of section 4.3.4.3.

4.4.4.1 Business Effects of Detailed Fish Operating Plan Hydro Operation and Response Strategies

The Problem

Because of continuing concerns over the decline in certain populations of salmon, there are a number of proposals to change the operation of the Federal Columbia River Power System in an effort to improve the survival of these fish, particularly in the downstream migration of juvenile fish toward the ocean. Potential changes in operations could significantly alter BPA's business activities under the six alternatives addressed in this EIS. The following assessment of impacts is based on the assumption that the system would be operated according to System Operating Strategy 9a (SOS 9a) from the SOR process. SOS 9a operation is intended to represent an extreme case hydro operation, in terms of its effect on BPA's business planning and marketing. If the operation ultimately selected in other processes results in lesser changes in the system, the effects on BPA's business activities will be correspondingly smaller.

The Power Impact

The changes in the operation of the power system under SOS 9a and in the environmental impacts of those operations are described in sections 2.1.6 and 4.3.4. SOS 9a, in brief, provides for increased flows during the spring on both the Snake and mainstem Columbia rivers; it includes spill at all dams, with reservoir drawdowns at all Lower Snake River projects and John Day Dam (see figure 4.3-5 for locations of hydro projects). These changes are expected to reduce significantly the capability of Federal hydro projects to produce power, particularly in the fall. Because flows would be shifted from fall and winter into spring, monthly energy capability could be reduced by as much as 6,000 monthly aMW in September through December during average water years, and by 8,000 monthly aMW for the same period during the driest years. Drawdown and spill would reduce Federal generation by 4,400 monthly aMW in each month from May through July. Regional peaking capability would also be reduced by 6,000 to 10,000 MW from September through January.

The Financial Costs

The regional costs of these losses in hydro energy capability are estimated to average $300 to $600 million annually, and could be as much as $1 billion in the driest years. Capacity losses could cost the region from $100 to $175 million, although some of this loss could be offset by the peaking capability of resources that would replace energy losses, to the extent the energy was replaced by generating resources rather than by purchases. This generating capacity offset would be no more than about half of the capacity loss, because the largest monthly energy losses would be about half the magnitude of the capacity loss. Costs to BPA, assuming BPA ratepayers absorb 75 percent of these costs (in proportion to BPA's share of generation along the affected river reaches), would be $300 to $600 million annually.

The Environmental Impact

Regardless of how the impacts of the generation capability losses are distributed throughout the region, there are a limited number of ways to replace the lost capability: in the short term, purchases of power from generation inside and outside the region (most likely gas-fired CTs and/or existing coal generation), and in the longer term, new generation and conservation sources. Although a variety of new generation and conservation sources are potentially available (as described in section 4.3, Generic Environmental Impacts, and in more detail in BPA's *Resource Programs Final EIS*), it is likely that new generation will be dominated by gas-fired CT impacts. The environmental impacts of CTs would depend on the quantity developed; impacts of CTs per megawatt are presented in Table 4.3-1, Typical Environmental Impacts From Power Generation and Transmission.

To the extent that lost generating capacity is replaced by imports from outside the region, there is a possibility that the capacity of the high-voltage interties that link the PNW to the south and east might have to be increased. Impacts of new 500-kV transmission vary considerably according to the new lines' location; typical impacts and land use requirements of transmission are presented in section 4.3.2, Transmission Development and Operation, and in Table 4.3-1, Typical Environmental Impacts from Power Generation and Transmission. The potential for developing new transmission is limited by the costs, the availability of right-of-way for new lines, and environmental concerns about new transmission facilities. In addition, because new interregional interties would take years to construct, they could not be expected to provide new opportunities for energy imports to replace lost hydro capability until after the study year for this EIS.

The Impact on BPA

Under an SOS 9a operation, BPA's near-term response would be to purchase power to replace the lost hydro capability. If the costs of replacement power were not anticipated in the rates in effect at the time SOS 9a operations were implemented, BPA's revenues likely would not be sufficient to pay its entire financial obligation, including its full annual payment to the U.S. Treasury, except in unusually wet years. If rates could be adjusted in response to the additional costs of power purchases, the effect of the additional costs would be to increase BPA's power rates. Increases in BPA's rate would give customers greater incentives to purchase power from non-BPA suppliers. Over the long term, BPA would probably replace the lost hydro capability with a combination of CTs and power purchases.

With the increase in costs resulting from SOS 9a operation, BPA would have to adopt response strategies to stabilize its loads and revenues. Unless BPA made some adjustment in response to SOS 9a operations to balance its costs with its revenues, the succession of partial or missed Treasury payments that would follow could be expected to trigger political intervention to address the continuing shortfall in BPA's payments.

Types of response strategies that BPA could consider to adjust to an SOS 9a operation are addressed in section 2.5.

4.4.4.2 Responses and Impacts Compared to 1994-1998 Biological Opinion (SOS 2d) Hydro Operation

For all of the EIS alternatives, the principal effect of SOS 9a hydro operation is the increase in the costs BPA incurs to meet its power supply obligations. Alternatives vary in the opportunities available for paying these costs.

Status Quo

Market Responses

Because average PF rates under this alternative would be above the maximum sustainable revenue level, the additional costs of implementing SOS 9a operations could greatly accelerate the shift of historical BPA loads to non-BPA suppliers. The amount of utility load switching from BPA to other suppliers could double from the estimates given under current hydro operations; little if any DSI load could be expected to continue BPA service. BPA would retain its utility and DSI loads only for the time they required to make alternative supply arrangements. Unless there were a large increase in the demand for power in other regions, BPA would be unlikely to sell its surplus firm power except at prices well below those necessary to recover costs.

BPA would be faced with revenue shortfalls and would likely be unable to make scheduled Treasury payments consistently. It would also potentially be unable, under severe hydro conditions, to meet its other financial commitments, such as WPPSS bond payments and conservation incentive payments.

In the face of a crisis due to BPA's failure to meet its financial obligations, BPA's spending would likely be curtailed, either voluntarily or through the intervention of DOE, FERC, the Treasury, or other parties. Cost reduction opportunities that BPA would adopt under other alternatives would be available under Status Quo, except to the extent that opportunities were lost due to delay.

In such a financial crisis, cost cutting could be expected to go beyond cuts that would permit established programs to continue. Curtailed spending could include suspending or terminating BPA's involvement in its most costly programs, including power resource acquisitions, transmission system development, energy conservation, the residential exchange program, and fish and wildlife enhancement, and potentially changing statutes to reduce or end BPA's role in supporting those programs. As a result, for those activities which serve a commercial market, market demand would create opportunities for other entities to take on former BPA functions. Where BPA's activities were based on non-commercial purposes, such as fish and wildlife enhancement or support for energy conservation and renewable resources, achievement would be reduced unless those purposes received financial support from other sources, either to continue BPA's efforts or to establish new implementation mechanisms.

Ultimately, under any of the EIS alternatives, radical measures to resolve BPA's financial crisis could redefine BPA's role in the region to resemble the Minimal BPA alternative. BPA could be forced to sell off assets to raise short-term cash. BPA's current mission could be truncated to eliminate financial risks and non-revenue-producing activities or assets, leaving BPA in a caretaker function for the system as it exists at the point when the financial crisis comes to a head. As a consequence of this redefinition, BPA's most important business role would likely be to manage the transmission system and residual generating capabilities to serve the surviving participants in the competitive wholesale power market.

Environmental Impacts

Impacts of generation, either from new CT development or from operation of existing generation to deliver purchased power to BPA, would increase to supply BPA with power to replace lost firm hydro capability. Correspondingly, except for spill, generation impacts within and outside the PNW would be reduced during spring flow periods due to displacement of thermal generation with BPA hydro generation from SOS 9a flows.

Most loads moving away from BPA service would be served with new CTs. The large load shift away from BPA would accelerate CT development, with consequent impacts on air quality, water consumption, and land use. CT operations, and therefore impacts, could be expected to rely upon displacement of CT generation with BPA nonfirm energy to reduce operating costs during spring flow augmentation periods. BPA would sell as much of the firm surplus resulting from lost loads as practicable, either displacing operation or deferring development of alternative resources, primarily CTs.

Curtailment of BPA energy conservation activities and renewable resource acquisitions would replace the environmental impacts of those resource types with the impacts of CTs, except to the extent that customers implement conservation or develop renewable resources, either independently or at the direction of regulatory agencies.

Response Strategies

Treating the Status Quo alternative as the no-action alternative, response strategies would be limited to the historical responses of raising rates to cover revenue requirements, which, as noted, would be of little help, at least with respect to firm power rates.

BPA Influence

Market Responses

Although firm power rates under BPA Influence are lower than in the Status Quo, they would still approach the maximum sustainable revenue level, and thus there would be little opportunity to use firm power rate increases to pay the added costs resulting from SOS 9a operation. Independent of the effect of a BPA rate increase, the prospect of a large increase in BPA's revenue requirement would reinforce customers' inclination to shift load to non-BPA suppliers as soon as practicable.

As under the Status Quo alternative, although to a slightly lesser degree, BPA would face significant revenue shortfalls and potential inability to make scheduled Treasury payments reliably. Unless BPA and its customers and constituents could agree on steps to restore stability, outside parties might intervene (as described above for the Status Quo alternative) to impose limits on BPA costs and activities.

One of the major cost reduction opportunities would be conservation incentive programs, which continue at historical levels under the BPA Influence alternative, and therefore have potential for reductions. Another area of potential savings would be BPA renewable resource acquisitions, which would be higher under this alternative than all others. Renewable resources are predicted to cost substantially more than the market price for power. A third area would be fish and wildlife programs, if the fish and wildlife benefits of SOS 9a operation made some of the other direct BPA-funded fish and wildlife measures unnecessary. Unlike the Status Quo alternative, under BPA Influence, BPA would already have adopted many other cost-cutting measures, so that additional cost-cutting would likely depend on curtailment of planned BPA program activities. As with Status Quo, where BPA activities were curtailed, other market suppliers could be expected to step in to replace BPA's commercial activities, while non-commercial BPA activities would only be replaced by specific measures to compensate for a reduced BPA role.

As noted above for the Status Quo alternative, a radical solution to relieving the financial burdens placed on BPA by SOS 9a operations could be to limit BPA's activities to managing the existing transmission system and power resources, leaving competitive marketing and noncommercial activities to other entities. This result is probably less likely under BPA Influence than under Status Quo, but adverse developments in the wholesale power market could worsen BPA's condition to the point where changes in its statutory missions could become a credible strategy to achieve financial stability.

Environmental Impacts

As with the Status Quo alternative, impacts of thermal generation would be shifted away from high-flow periods and toward fall/winter low-flow periods according to the requirements of SOS 9a operation. Where the thermal plants are located would determine whether air quality would be improved or reduced by such seasonal shifts.

CTs would serve most of the electrical load shifting away from BPA. If BPA conservation spending was reduced so that conservation achievement declined, additional CT impacts would occur as CTs were operated to serve the load that otherwise would have been met with conservation.

Response Strategies

Raising firm power rates would provide little if any benefit in meeting the additional costs of an SOS 9a operation, because the average PF rate under the BPA Influence alternative would already be at about the level of BPA's maximum sustainable revenues. Firm power rate increases would not add revenue, and could actually reduce revenue by increasing BPA's load losses.

Because BPA would offer unbundled power products and services and seek to develop new product lines under the BPA Influence alternative, there would be opportunities to increase revenue in response to an SOS 9a operation that would not be available under the Status Quo alternative. In particular, BPA could charge higher prices for products based on hydro flexibility, to take fullest advantage of its large share of regional hydro generation and the higher costs of providing generation support from non-hydro facilities. It is unlikely that these marketing efforts would be able to cover more than a fraction of the additional costs of SOS 9a operation by 2002, although, depending on BPA's marketing success, they eventually might provide hundreds of millions of dollars in revenue.

Given that the BPA Influence alternative is oriented toward additional incentives or conditions that promote the goals of the Northwest Power Act, BPA might take steps under an SOS 9a operation to prevent customer loads from switching to other suppliers and therefore escaping the terms of BPA service that support the Act's goals. Specifically, BPA could implement a stranded investment charge, both to discourage customers from terminating BPA service, and to raise the maximum sustainable revenue level and increase BPA's revenues to better enable BPA to pay the additional costs of an SOS 9a operation. Although the continuing downward trend in the cost of non-BPA power could reduce the benefits, a stranded investment charge that increased the total cost of shifting load from BPA to other suppliers by 5 mills/kWh could provide BPA with enough revenue to pay most of the additional costs of SOS 9a operation.

BPA could meet some of the SOS 9a costs through cost cuts. With cost reductions and program changes like those in the Market-Driven alternative, significant savings (roughly half of the historical spending for conservation programs) could be obtained in BPA's energy conservation activities. As above, if operational changes under SOS 9a were effective in improving the survival of declining salmon runs, the direct costs to BPA for other fish and wildlife measures might be reduced. Other cost reductions would probably reduce BPA's ability to achieve program goals, and might require changes in the statutes that define BPA's missions.

Strategies to transfer BPA costs to other entities could also help BPA to adapt to the additional costs of SOS 9a operations. Credit for fish and wildlife expenditures under section 4(h)(10)(C) would be a high priority. In keeping with the emphasis in this alternative for promoting the goals of the Northwest Power Act, if other measures were not sufficient to meet the costs of SOS 9a operations, BPA and its customers and constituents would likely seek appropriations to allow BPA to continue its efforts to achieve the goals of the Act.

Market-Driven BPA

Market Responses

Estimated BPA rates under the Market-Driven alternative are somewhat below the maximum sustainable revenue level, so there might be some potential for additional revenue through increases in firm power rates. Rate increases would increase the amount of BPA customers' loads that would shift to other suppliers. Aside from the direct effect of a rate increase on BPA's loads, the addition of SOS 9a costs to BPA's financial obligations would reinforce customers' concerns about unpredictable BPA costs, and further increase their tendency to shift load away from BPA.

Because of the opportunity to maintain and potentially increase revenues from firm power sales, the potential for revenue shortfall would be less under the Market-Driven alternative than under the BPA Influence alternative, and the amount of the shortfall would also likely be less. However, a significant decline in the price of power in the wholesale market could reduce BPA's revenues below the amount necessary to pay all of its costs and lead to initiatives to limit BPA's activities, as described above for the Status Quo and BPA Influence alternatives.

The wide-ranging spending reductions already incorporated into this alternative would limit further opportunities for cost savings. The most prominent exception would be the potential that SOS 9a would be so effective in restoring fish runs that other BPA fish and wildlife spending could be reduced. Additional spending reductions would likely reduce achievement of BPA's program goals. If spending reductions were accomplished by cutting back on BPA's program responsibilities, achievement of current program goals would be reduced unless other entities filled in where BPA's activity decreased.

Environmental Impacts

Consistent with previous alternatives, the chief environmental impacts of the Market-Driven alternative under SOS 9a operations would be the impacts of resources or power purchases BPA arranged to replace lost firm hydro capability and the complementary spring displacement of thermal generation by hydro generation from higher spring flows under SOS 9a. CT impacts would increase from development and operation of additional CTs to serve loads moving away from BPA service. Impacts of generation also would increase if energy conservation achievement in the region were reduced due to cost cuts in conservation programs.

Response Strategies

BPA would raise firm power rates to the extent they would generate additional revenue to meet SOS 9a costs, and strive to increase revenues from sales of unbundled products and services, new product lines, and expanded extraregional and joint venture marketing. BPA would also make all practical operational arrangements to enhance marketing of generation available under SOS 9a operation, including storage and other adjustments in hydro operations. BPA would explore additional spending reductions that could be accomplished without jeopardizing achievement of its mandated missions.

Although a stranded investment charge could provide significant revenues to help cover SOS 9a costs, because of its coercive effect, it would be inconsistent with the concept of a Market-Driven BPA, and so BPA would not consider implementing it unless the utility industry generally adopted such charges, perhaps to temper the utilities' transition to a competitive power market.

FERC issued a Notice of Proposed Rulemaking (NOPR) on Open Access Transmission Services and Stranded Cost Recovery on March 29, 1995. This NOPR strongly supports the position that utilities have the opportunity for full recovery of the costs of stranded assets through the use of surcharges in transmission rates. While only a proposal, if this NOPR is adopted in its current form, it will provide BPA with additional support for implementation of a stranded investment charge for customers which chose to leave the system for lower-priced power from alternative suppliers or self-generation. BPA would not be in the position, as it would be now, as one of the few utilities in the United States imposing a stranded investment charge.

As with the other alternatives, BPA would take steps to transfer appropriate costs to other entities, particularly seeking credits under section 4(h)(10)(C) of the Northwest Power Act for fish and wildlife expenditures not attributable to the share of FCRPS costs allocated to power production. BPA might seek cost-sharing contributions from other participants or sponsors in its programs, and if appropriate, would pursue authorization to transfer program and financial responsibility to other agencies.

Maximize Financial Returns

Market Responses

BPA's rate under the Maximize Financial Returns alternative would be set deliberately at the maximum sustainable revenue level, independent of BPA's costs. Costs would be comparable to those of the Market-Driven alternative, and perhaps somewhat lower, so this alternative would generate substantial revenues above costs under current hydro operations. Expected SOS 9a costs would exceed even the maximum revenues under Maximize Financial Returns. BPA would not drive load away by increasing rates, recognizing that there would be no revenue benefit from a rate increase, but any confidence on the part of customers that BPA's rates would not increase would be undermined by the prospect that the additional costs above maximum revenues would render BPA insolvent as a business, and customer fears could lead them to shift load away from BPA service even if BPA did not act to increase firm power rates.

The revenues above costs that BPA would accrue under current hydro operations help BPA in paying the additional costs of SOS 9a operation, but would not be enough to cover all of the additional costs. BPA could avoid a revenue shortfall only through additional measures to balance revenues with costs. As with other alternatives, a decline in the price of competitors' power would worsen the situation and increase the likelihood of intervention to curtail BPA's activities.

Because the Maximize Financial Returns alternative is intended to represent a BPA that functions like a profit-making business, there would be few opportunities for additional cost reductions to help to balance revenues with SOS 9a costs. As with the Market-Driven alternative, savings in fish and wildlife spending might be possible if SOS 9a operations eliminated the need for some fish and wildlife measures.

Environmental Impacts

The impacts of the redistribution of hydro capability among the months of the year would be the same as under the other alternatives. Likewise, impacts of CT operation would increase to serve load shifting away from BPA service.

Response Strategies

BPA would not raise firm power rates under this alternative. There might be some increases in revenue available from increasing transmission rates. A stranded investment charge could help to increase revenues from loads moving off BPA service, and would increase the cost of non-BPA power and services, raising the maximum sustainable revenue level and enhancing BPA's ability to generate revenue to pay SOS 9a costs.

Based on the business interests of a BPA operated like a private profit-making enterprise, BPA would presumably have adopted most of the available cost-cutting measures under this alternative. Some cost savings could result from selling shares of new transmission capacity, or from increased Treasury borrowing or lowering the probability of making annual Treasury payments, but these steps would raise issues of debt ratio or credit worthiness that could make them undesirable for a revenue-maximizing business.

As with the previous alternatives, the 4(h)(10)(C) credit could make a significant contribution to BPA's revenues, and would be a high priority to mitigate the additional costs of SOS 9a operation. If other measures were not enough to pay any remaining SOS 9a costs, BPA would seek appropriations to prevent recurrent and unplanned failures to make scheduled Treasury payments.

Minimal BPA Marketing

Market Responses

Because BPA's obligations under the Minimal BPA alternative would be limited by the capability of its existing resources, and because SOS 9a operation would result in a reduction in the amount of power BPA would provide to its customers, BPA's customers' shares of BPA power would be reduced, and they would have to obtain replacement power from other sources. Public preference rights could put most of the reduction in available BPA firm power on the DSIs. (There are questions about how the seasonal shape of the lost hydro potential would fit with DSI loads.) In most cases, the replacement power would be supplied from CT generation.

In addition, as with the other alternatives, BPA's firm power price would increase to the maximum sustainable revenue level. As a result, some loads would shift away from BPA service. The effect of the increase in BPA's firm power rate would be to drive away some loads, leaving BPA with unmarketable requirements firm power that BPA would have to sell as firm surplus.

Environmental Impacts

The basic environmental impacts of the redistribution of hydro generation among the months of the year would be the same as for other alternatives. The most important difference under the Minimal BPA alternative would be that customers, rather than BPA, would make the choice of resources to replace lost hydro capability. BPA's choices would be influenced by the Council's Power Plan, whereas customers would be constrained mainly by least-cost planning or integrated resource planning requirements of state public utility commissions or resource siting authorities.

Response Strategies

BPA could raise power rates up to the maximum sustainable revenue level, as noted above. A stranded investment charge could provide significant amounts of additional direct revenue from loads moving off BPA service, and would raise the maximum sustainable revenue level, but it would imply more BPA intervention in customer choice than a "caretaker" role under this alternative would suggest.

Because BPA would have cut back on most of its program activities and would be a smaller organization than under the other alternatives, it is unlikely that significant additional spending reductions would be available under this alternative. As with other alternatives above, there might be some potential savings if some BPA-funded fish and wildlife program measures were rendered unnecessary by the implementation of SOS 9a operation.

As under all of the previous alternatives, BPA would almost certainly seek credit for the non-power share of its fish and wildlife expenditures under section 4(h)(10)(C) of the Northwest Power Act, and might seek appropriations for other SOS 9a costs if other strategies were not sufficient to balance revenues with costs.

Short-Term Marketing

Market Responses

Rates under the Short-Term Marketing alternative are about the same as those under the Market-Driven alternative; therefore, the rate and load effects would also be similar. Loads would decline with the increase in rates to the maximum sustainable revenue level, and SOS 9a costs would heighten customers' concerns about BPA costs.

As with the other alternatives, costs exceeding BPA’s revenues would create a potential for intervention to limit BPA’s activities, and could force BPA into decisions about priority among obligations to determine which would be paid.

Spending could be reduced if some fish and wildlife spending were rendered unnecessary, or if BPA’s program activities were curtailed. Other entities might take over discontinued BPA activities, depending on their potential business opportunities or funding support.

Environmental Impacts

Impacts would be essentially the same as those of the Market-Driven alternative.

Response Strategies

BPA would raise power rates to the maximum sustainable revenue level, and increase revenues from other activities to the extent feasible. The increased costs of SOS 9a operation might motivate BPA to expand its marketing beyond short-term marketing in order to increase revenue.

BPA would not implement a stranded investment charge under this alternative unless such a charge became an industry standard.

To help balance revenues with costs, BPA would implement any feasible spending reductions that were consistent with achieving its missions.

BPA would take advantage of any available sources of financial support, at a minimum seeking credit for fish and wildlife expenditures under section 4(h)(10)(C) of the Northwest Power Act, and likely including other prospects for cost-sharing, appropriations, or the transfer of financial and program obligations to other agencies.

4.4.5 Planning Uncertainties

The analysis of market responses under the alternatives presented above is based on a number of assumptions about conditions in the regional electric energy market. These assumptions generally describe conditions like those that the region has experienced in the past. There is considerable uncertainty about some of the conditions that affect BPA planning. Changes could occur regardless of BPA's actions as described in the alternatives. Because some of the changes could be significant, major issues of planning uncertainty are discussed below.

Where possible, the effects of these uncertainties are expressed in terms of the amount by which they change BPA's revenue requirement. The effect on BPA's rates can be estimated using the rule of thumb that every $100 million change in BPA's revenue requirement results in roughly a 1 mill/kWh change in the Priority Firm rate if the revenue is assumed to come from PF sales. Increases in BPA's PF rate typically result in load reductions among consumers due to price elasticity, and may induce utility and DSI customers to purchase non-BPA services, further reducing BPA's loads and resource needs. (Note that the demand elasticity of BPA’s wholesale power customers—electric utilities and large DSIs—is vastly different in magnitude, though not in motivation, from the more commonly considered elasticity of residential, commercial, and industrial power consumers.) Such reductions could either reduce BPA's resource acquisition costs, or increase the amounts of surplus power BPA would have available.

Table 4.4-21 compares the effects of the issues.

Table 4.4-21: Potential Effects of Planning Uncertainties on BPA Revenues, PF Rates, and Loads in 2002

Type of Planning Uncertainty	Potential Effect on BPA Annual Revenues ($M)	Potential Effect on BPA's PF Rate (mills/kWh)	Potential Effect on Forecasted BPA Loads (aMW)
Low Load Growth	-220	Reduce increases	-2,800
High Load Growth	+180	+1.5	+2,300
Revenue Financing at Borrowing Limit	Requirement +240	+2.4	-175
Repayment Reform	Requirement +300	+3	-225
Debt Refinancing	Requirement +30	+0.3	-25
Lost Hydro Firm Capability Due to Extended Drought	Requirement +20/100 aMW lost firm hydro	+0.2/100 aMW	-15/100 aMW
Aluminum Price	+70 to +220 at prices 70¢/lb to $1.00/lb	-0.7 to -2	+800 aMW (in DSI loads) at 70¢/lb or more
Carbon Tax or Increase in Natural Gas Price	Increased costs for CT generation	Increases due to purchases of CT generation	Reduce BPA load loss to customer CT generation

4.4.5.1 High or Low Load Growth

The alternatives are evaluated in terms of the medium load forecast as published in the 1995 Rate Case. Potential future regional loads could vary by several thousand average megawatts due to economic conditions, consumer fuel choices, or other influences on demand. If actual loads were to deviate from the medium forecast, resource needs and power sales might change significantly from the amounts shown above. Higher loads could present opportunities to market surplus resources, but whether BPA served those loads would depend on utilities' and perhaps consumers' choices of energy supplier. Lower loads would increase the surpluses BPA would need to market to recover resource costs. For a 1,000 aMW reduction from medium loads, BPA revenues would be reduced $80 million or more in 2002 due to the sale of firm power as nonfirm (assuming a PF rate of about 27 mills/kWh and an average nonfirm price of 18 mills/kWh). For increases in loads above the medium forecast, the effect would be the reverse, except to the extent that increases in loads were not served by BPA. The extremes of forecasted loads could increase or decrease BPA's revenues by over $300 million annually. Using the rule of thumb described above, extremes of loads could raise or lower BPA's PF rate by more than 3 mills/kWh, with corresponding effects on BPA's loads and resource needs.

An increase in the average PF rate would result in a response to price among consumers that would cause them to reduce loads. A rule of thumb for price elasticity of retail loads of BPA's utility customers is that a 1-percent increase in the PF rate results in a 0.3-percent reduction in loads. Using that rule, and rounding off a 1-mill increase in the PF rate to a 4-percent increase (from the current PF rate of about 27 mills), a 1-mill increase in BPA's rates would result in about a 1.2-percent reduction in BPA's utility loads, or about 75 aMW in 2003. (DSI loads are not assumed to respond the same as utility loads, due to particular conditions of PNW aluminum plants and the aluminum market, and their variable rate.)

4.4.5.2 Exhaustion of BPA Borrowing Authority

BPA currently finances its capital investments by borrowing from the Federal Treasury. The statutes that authorize BPA to use Treasury financing establish limits on the total amount that BPA may borrow. These limits are $1.25 billion for energy conservation, and $2.5 billion for power system facilities. Projected capital investments in the next several years would reach these borrowing limits. Once the limits were reached, BPA could obtain authorization for further Treasury borrowing, finance investments from other sources such as third parties, use revenues from the sale of BPA products and services to pay for capital investments without borrowing, or limit its capital expenditures so that annual BPA borrowing did not exceed annual authorization.

If BPA did not obtain authority for additional borrowing, and chose to finance capital programs from power revenues, the result would be a substantial increase in BPA's annual revenue requirement. Based on current estimated capital program levels (after including recent cost-cutting efforts), revenue financing for these programs after BPA reached the borrowing limit would increase BPA's annual revenue requirement, starting in 2001, by about $76 million, increasing in the out years.

Again using the rule of thumb described above, revenue financing could increase BPA's PF rate by over 2 mills/kWh by 2002, with corresponding effects on BPA's loads and resource needs.

4.4.5.3 Changes in Repayment of Federal Investment in the FCRPS: Repayment Acceleration or Debt Refinancing

One of BPA's major financial obligations is the repayment of the Federal investment in the Pacific Northwest power system. Over the past several years, there have been repeated proposals to accelerate or modify the terms for repayment of this debt. A related concept is refinancing the Federal debt on the power system.

Since the mid-1980s, each President's budget but one has included a proposal to restructure BPA's repayment of appropriated debt in order to address what some perceive as a taxpayer subsidy because of the low interest rates on some of the appropriations. The proposals have included increasing the interest rate on the debt and repaying the debt on a fixed amortization schedule over the remaining repayment period, rather than the flexible schedule now in use. Potential rate impacts have varied according to the particular proposal, but have tended to range between 10 and 15 percent, or in the range of $300 million in additional revenues per year.

In the fall of 1993, as part of Vice President Gore's initiative on reinventing government, the Clinton administration submitted legislation calling for BPA to buy out its outstanding repayment obligations on appropriations with debt that it would sell in the open market. The Congressional Budget Office (CBO) interpreted the legislation as adding to the Federal deficit because BPA's cost of debt in the open market was projected to be higher than Treasury's. Subsequently, BPA worked with its customers and constituents to develop Treasury-based buy-out options that would not increase the deficit, would be rate-neutral or near-rate-neutral, enable an equitable and predictable allocation of costs and benefits of buy-out to generation and transmission customers, and address subsidy criticisms.

In January 1995, Senator Hatfield introduced legislation that meets these objectives by allowing BPA to "reconstitute" its outstanding repayment obligations on appropriations by replacing them with new repayment obligations. Principal on the new repayment obligations would be set at the present value of BPA's debt service payment on appropriations under a term schedule, plus $100 million. The new principal would be assigned current market interest rates, and existing due dates for retiring the obligations would be retained. The proposal is designed not to increase the deficit over the FY 1995-1999 budget window, and to result in near-neutrality in rates for both generation and transmission. Preliminary estimates show BPA's revenue requirements increasing by roughly $30 million per year under this proposal.

4.4.5.4 Extended Drought

Abnormal climatic conditions, notably the El Niño phenomenon in the western Pacific Ocean, have been linked to several years of below-normal precipitation for the Pacific Northwest in the last decade. Continued drought could have adverse effects on power availability, because the Pacific Northwest electric power system has such a high percentage of hydro generation.

Regional electric energy planning has developed based on an accumulation of historical information covering more than 60 years of runoff data. This information is used to anticipate firm hydro power availability and nonfirm energy sales. Compared to geologic time periods, the amount of historical information about the

Pacific Northwest climate that is available to predict streamflow is very small. It is possible that the typical climate is drier, and therefore hydro runoff is less than the 60-year record indicates. Alternatively, it is possible that the climate of the Pacific Northwest is changing, due either to global warming or other changes such as long-term natural climatic cycles. If either of these hypotheses is correct, and the rainfall in the region continues to be less than historical averages, power availability and BPA's hydro-based power revenues would also decline.

The effect of an extended drought would be similar to the effect of the loss in firm hydro capability. The difference would be that, with chronic low runoff, the loss in firm capability would not be offset by nonfirm energy sales, because the flow itself would be less, rather than BPA having less flow available for firm energy generation. The monetary cost to BPA of an extended drought, per kWh lost, would be about three times that of the losses in firm hydro capability due to system operations changes, because there would be no offsetting nonfirm sales. For every 100 aMW of lost generation, the monetary effect on BPA, at 25 mills/kWh, would be over $20 million annually. The extent of the loss depends on how much flow would be reduced on the river system.

4.4.5.5 Change in Aluminum Price

In 1994, the aluminum industry purchased about one-fourth of the energy BPA sold. BPA's revenues and its operational relationship with aluminum plants are significantly affected by changes in the price of aluminum, partly due to the Variable Industrial Power (VI) rate which governs sales to those plants and which is tied to the U.S. transaction price for aluminum. During the late 1980s, high aluminum prices increased BPA's revenues under the VI rate. Recent depressed prices (due to increased world economic activity), continued operation of smelters with variable production costs during this period of low prices, and the sale of aluminum from plants in the former Soviet Union, have reduced BPA's revenues. These unpredictable changes add to uncertainty in BPA's aluminum DSI loads, because plants may shut down in response to adverse market conditions and cease buying power, and in BPA's revenues, both as the variable rate changes and as plants change operations.

Although the price of aluminum continues to be unpredictable, it is possible to estimate the effect of different aluminum prices on the operations and energy choices of Pacific Northwest plants. Recent prices have ranged between 75 and 85 cents per pound.

One measure of the effect of aluminum prices in relation to BPA rates is the "break-even" point, where the market price is enough to equal all production costs, including BPA power costs, without any profit. The break-even points for PNW aluminum smelters, when all 10 PNW smelters will operate, in relation to different levels of BPA rates, are as follows:

BPA Rate	Break-Even Aluminum Price
26 mills/kWh (current VI "plateau" rate)	70 cents
30 mills/kWh	73 cents
35 mills/kWh (a hypothetical CT cost)	77 cents
40 mills/kWh	80 cents

Since businesses need some profit margin to remain viable, the above figures do not necessarily indicate whether the smelters would actually operate. Considering that aluminum is a cyclical business, there should be enough profit margin to provide for market uncertainties and risks. Taking into account all the risks involved, the following points summarize expected responses of PNW smelters to power prices, whether from BPA or from other suppliers.

- At the expected long-term price averaging 80 cents per pound, all PNW smelters would remain operating with rates up to 29 mills/kWh.
- At 30 mills/kWh, the least-profitable plants probably would cease operations.
- At 35 mills/kWh, half the smelters probably would not operate.

- At 40 mills/kWh, the remaining half probably would cease operations.

There are other factors which may alter these general conclusions. For example, the new clean air environmental standards which go into effect in 1997 likely will add to operating costs and raise the break-even price or lower the power rate levels that may lead to plant shutdowns.

Under the existing variable rate, changes in the price of aluminum affect BPA's revenues. The current variable rate, based on the price of aluminum, is 26 mills/kWh. This adds about $73 million to BPA's revenues from current aluminum industry loads (about 2,100 aMW), as compared to the DSI rate when the draft BP EIS was prepared. Recent high prices (75 to 85 cents) could also encourage PNW plants to come up to full loads (about 2,900 aMW), adding another $70 million to BPA's revenues (comparing sales at the variable price to an average nonfirm price of 16 mills/kWh). If the price of aluminum stays above 94 cents per pound, the variable rate would increase still further, reaching its maximum of 32 mills/kWh at $1.02 per pound, which, at full capacity for PNW plants, would give BPA an additional $150 million in revenues. (The aluminum price levels that govern BPA rates under the VI rate schedule will be adjusted slightly in July 1995.)

Changes in aluminum prices affect BPA's revenues under the VI rate. Changes in the amount of aluminum DSI load operating affect BPA's resource needs, and the environmental impacts of both resource operations and smelter operations.

4.4.5.6 Changes in Energy Resource Technology

The conclusions in this EIS about the relative amounts of resource development among the alternatives are founded on current information about the relative costs of different energy resource technologies. As the re-emergence of natural gas generation as a competitive resource in recent years demonstrates, the market for electric energy can change rapidly as prices change and technologies evolve. A number of potential developments could significantly change the Pacific Northwest electric energy market from the conclusions that are described here.

For example, CT technology could continue to increase fuel efficiency, size, and environmental performance, and therefore the price competitiveness of CTs in relation to other resources. Fuel cells are another technology that appears to be on the brink of commercialization. Fuel cells could conceivably be available in sizes which could serve individual communities or industries, as "distributed generation" which could change the market for transmission services from long-distance delivery of wholesale power toward delivery of backup service and reserves based on load or outage diversity. Widespread commercialization of photovoltaic cells, producing supplemental energy during daylight hours, could alter system load shapes, reducing peak demands and increasing the effective use of existing transmission and generation.

The effects of these developments are difficult to quantify, but they reinforce the view that long-term planning must be flexible enough to accommodate new developments. One major risk is the potential that BPA or other regional utilities will have unmarketable surplus power due to the proliferation of generation that supplies end-use loads and displaces BPA or utility generation. Costs of stranded investments in resources would compound the challenge of maintaining competitive pricing.

4.4.5.7 Changes in Environmental Laws and Regulations

Carbon Tax

Relative costs of energy resources can be profoundly affected by changes in environmental laws and regulations. One example is the concept of a "carbon tax" on fossil fuels used to power generating facilities. Such a tax would be based on those facilities' potential to emit carbon dioxide or other "greenhouse" gases. A carbon tax would have to be very large (sufficient to raise the levelized resource cost to about 50 mills/kWh, a tax of about 13 mills/kWh) to displace natural gas-fired CTs from their dominance among resources available to provide additional power to the PNW. However, any carbon tax would add to the cost of carbon-based generation, and would affect the price at which BPA's customers would be motivated to purchase from other suppliers rather than BPA. The result would be to reduce losses of BPA's loads to independently developed gas-fired generation and reduce fossil-fueled resource development by other suppliers across all of the alternatives addressed in this EIS. To the extent BPA acquired gas-fired generation to supply firm loads, BPA's costs would also increase as a result of a carbon tax.

Curtailment of Natural Gas Supply

Another possibility is the potential for restrictions on the export of natural gas from Canada to the United States. If such restrictions were adopted, the potential for natural gas-fired generation could be reduced dramatically. The effect would be to shift resource development to other resources with higher costs, and, as above, to increase the BPA rate which would cause BPA's customers to purchase generation from other suppliers. One possibility would be that coal gasification technology might develop to the point where it could supply fuel for CTs. If so, the impacts of generation fueled by coal gasification would include the impacts of coal mining and the gasification process.

EMF Regulations

Regulations concerning EMF could have a significant effect on BPA's transmission development and operations. High-voltage transmission lines, such as those on BPA's transmission system, generate EMF when power is flowing over the lines. There is widespread interest in determining whether EMF exposure results in adverse effects on human health. Some of this interest has led to legislative or regulatory proposals to establish EMF standards. To date, six states (OR, FL, MN, NJ, NY, and MT) have established electric field standards, and two of those (FL and NY) have established magnetic field standards. Other proposals for standards have been raised at the Federal, state, and local levels. BPA has adopted guidelines addressing its practices with regard to EMF in its "1995 Guidelines on Electric and Magnetic Fields." (Electric Power Lines Questions and Answers on Research into Health Effects, in press, publication June 1995.)

So far, regulations on EMF have not required significant changes in BPA's transmission operations or development. However, if serious health effects were demonstrated, standards could potentially become stringent enough to limit BPA's use of its existing transmission facilities, or prevent development of new transmission lines in populous areas. Constraints on transmission capacity arising from EMF regulations could limit the amounts of power BPA could deliver, which could create problems meeting load during peak demand periods. Long-term limitations could cause power outages at load centers dependent on distant generators, and could stimulate local demand management or generation development.

Stricter Regulations on Emissions

Tightening regulations on releases of pollutants into air, water, or land predictably increase the costs of power generation and industrial operations which produce such pollutants. For power generating resources, such changes, like the carbon tax, would increase the costs of some resources relative to resources which did not produce the same types of pollutants, and could alter BPA's and its customers' decisions about resource acquisitions under least-cost resource plans. For industrial operations, increased costs for pollution control measures could add to the effect of differences in power costs on economic decisions, such as whether to expand production, continue operation, or close. In the Pacific Northwest, industries which might be affected by such changes in laws include aluminum, chlor\alkali, wood products, pulp and paper, and food products.

4.4.5.8 Changes in the Price of Natural Gas

Most current proposals for the development of new electric power resources are based on the expectation that abundant supplies of low-cost natural gas will be available over the long term. If the price of natural gas increased, proposed new gas-fired generating resources might be less appealing in comparison to other types of resources, such as cogeneration, energy conservation or DSM, and renewable resources. Events which could lead to an increase in the price of natural gas would include natural disasters in regions supplying the gas, new taxes (such as the carbon tax discussed above), or the discovery of new costs or hazards associated with producing gas. As was noted above, based on current estimates of the relative costs of different energy resources for the PNW, the total increase in price, including production costs and taxes, would have to raise the cost of natural gas resources to 50 mills/kWh or more to substantially displace natural gas as the dominant type of resource for new electrical generation. As stated earlier, the spot market price of gas was in the $1.00 to $1.50/MMBtu throughout the winter of 1994-95. For the latest generation of CTs, these gas prices translate into an operating cost of between 8 and 12 mills/kWh. If gas prices continue to fall, or stay at current levels, this could place additional pressure on utilities in the region to shut down high operating cost base-load thermal power plants. Plants at the greatest risk of closing are nuclear and coal plants with high operating costs.

Increases in natural gas costs below the level that would change the resource mix for the PNW would affect BPA, though, by increasing the cost at which customers would choose to purchase from other suppliers rather than from BPA. Higher gas prices would tend to increase BPA loads and shift resource acquisitions to BPA from other suppliers.

4.5 Market Responses and Impacts of Modules

The sections that follow describe the market responses and environmental impacts of the policy modules described in chapter 2. Table 4.5-1 presents a summary of the impacts of the modules as they apply in each alternative.